IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Lorne Trottier et al.
Serial No.:	09/653,701
Filing Date:	September 1, 2000
Confirmation No.:	5894
For:	REAL-TIME VIDEO EDITING ARCHITECTURE
Examiner:	Vent, Jamie J.
Art Unit:	2621

Commissioner for Patents
Washington, D.C. 20231

DECLARATION OF LORNE TROTTIER, MICHEL ST-PIERRE, ANDRÉ LAFRAMBOISE AND JEAN LAPIERRE UNDER 37 C.F.R. § 1.131

Sir:

We, the undersigned, Lorne Trottier, Michel St-Pierre, André Laframboise and Jean Lapierre, all current or former employees of Matrox Electronics Systems, declare that:

1. We are co-inventors of the claimed subject matter of above-identified patent application. We make this declaration in support of that application and in response to the Office Action mailed July 9, 2008.

2. Prior to November 9, 1999, we conceived of a system for real-time video editing and began working to develop it. The video editing system was included in a product referred to as the Matrox RT2000 product ("RT2000 product"). The RT2000 product included two printed circuit boards, a breakout box and software provided on compact disks. A first of the two printed circuit boards included a codec, and the second of the printed circuit boards included the graphics accelerator. The graphics accelerator chip included in the RT2000 product is referred to as the "G400 graphics accelerator chip."

3. The RT2000 product was built and tested in Canada prior to November 9, 1999. The testing included FCC certification testing including testing conducted while the RT2000 product was

used to perform real-time editing of multiple video signals with the G400 graphics accelerator chip.

4. Attached as Exhibit A is a copy of a FCC Certification and Immunity Doc Report from prior to November 9, 1999. Exhibit A provides the results for a variety of tests which were performed to confirm compliance of the RT2000 product with FCC requirements while the RT2000 product was in use with a computer system. These tests included sensing for radiated and conducted emissions and immunity testing. The testing was performed by the Matrox Conformity Group in Canada. Exhibit A illustrates the equipment configuration of the system including the RT2000 product for the testing. Reference to some of the test configurations is referred to here, for example, as illustrated in Figures 5.1, 5.2, 5.3, 5.4, 5.5, and 5.6 appearing at pages 19 through 24 of Exhibit A.

5. Attached as Exhibit E is an annotated version Figure 5.3. Exhibit E is annotated to illustrate the location of the breakout box and the two printed circuit boards provided with the RT2000 product included in the system as configured for the FCC testing described in paragraph 4.

6. Exhibit A also illustrates a block diagram of the printed circuit boards included in the RT2000 product. The block diagram appears at page 18 of Exhibit A and is identified as Figure 4.1.

7. Attached as Exhibit B is an annotated version of the block diagram illustrated in Figure 4.1 of Exhibit A. Exhibit B is annotated to highlight a video decoder, a codec and associated decompression device, a graphics accelerator chip, a video input, a video output, a frame buffer including an input buffer and an output buffer, a graphics input, a video encoder, a video bus configured to provide multiple real-time compressed video signals to the graphics accelerator chip and an input for a compressed digital video stream from an external device, in particular, an input configured for IEEE 1394.

8. Attached as Exhibit C is a block diagram of the printed circuit board including the G400 graphics accelerator chip which was developed and tested in the RT2000 product before the date of November 9, 1999, for example, with the system subject to the FCC testing described in Exhibit A. The block diagram is highlighted to illustrate the following elements: a graphics accelerator chip, a video input, a graphics input configured to receive graphics data, a frame buffer, a 2D graphics engine, a 3D rendering engine and a video output configured to output the edited uncompressed digital video stream. The video input identified as "Vin" in Exhibit C corresponds to the video input identified in Exhibit B. During some portions of the testing documented in Exhibit A and Exhibit D, the video input was configured to provide at least two video inputs to receive at least two real-time uncompressed digital video streams (for example, two real time uncompressed digital video streams provided over a time division multiplexed bus). Further, during portions of the testing in which the video input was configured to provide at least two video inputs to receive at least two real-time uncompressed digital video streams, the G400 graphics accelerator chip was configured and operated to receive at least two real-time uncompressed digital video streams at the at least two video inputs.

9. Attached as Exhibit D is a report concerning the results of radiated emission testing of the emissions generated by the RT2000 product. Pages 7 through 9 describe testing performed when the RT2000 system was performing dual stream playback with live effects. Reference to the "dual stream playback with live effects" in Exhibit D refers to real-time editing of at least two real-time uncompressed digital video streams with the G400 graphics accelerator chip included in the RT2000 product.

10. We, the undersigned, declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of title 18 of the United States Code, and that such willful false statements may jeopardize the validity of this document and any patent which may issue from the above-identified patent application.

Date: Dec 2, 2008

Lorne Trottier

Date: _____

Michel St-Pierre

Date: Dec 4, 2008

André Laframboise

Date: Dec 4, 2008

Jean Lapierre

10. We, the undersigned, declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of title 18 of the United States Code, and that such willful false statements may jeopardize the validity of this document and any patent which may issue from the above-identified patent application.

Date: _____

Lorne Trottier

Date: 2006/12/03

Michel St-Pierre

Date: _____

André Laframboise

Date: _____

Jean Lapierre

matrox

FCC CERTIFICATION AND IMMUNITY DOC REPORT

MATROX CONFORMITY GROUP

RT2000/KIT/N, Digital Device

Project : 0895_01_02

Date :

This report concerns: (check) Equipment type (ex. Computer, printer, modem, etc.): Video Editor	☒ Emission tests at 3 and 10 m ☒ Immunity tests ☒ D.O.C Procedure
Transition Rules Request per 15.37 ?	[ ] yes [X] no
If no, assumed Part 15, Subpart B for unintentional radiators – the new 47 CFR [10-1-90 Edition] provision.	
Report prepared by: Signature	Daniel Couillard Matrox Electronic Systems Ltd. 1055 St. Regis Boulevard Dorval (Quebec) Canada H9P 2T4 Tel.: (514) 822-6000 ext. 2479 Fax.: (514) 822-6275 e-mail: daniel.couillard@matrox.com
For: Matrox Electronic Systems Ltd. Client: Michel Bourgeois, Product responsible	
Verified by : Conformity Group Manager:	Benoît Nadeau, P.eng., M.eng., Matrox Conformity Group Manager Date:

ACCREDITED

1 EXECUTIVE SUMMARY

The following table lists all the standards, levels or classes and passing criteria that the Equipment Under Test (EUT) met

Standard	Minimum Conditions	Class/Criteria
FCC PART 15	3 meters measuring distance and conduction	B
EN55022:1995	10 meters measuring distance and conduction	B
EN61000-3-3:1995	Long Duration (when applicable)	PASS
EN61000-4-2:1995	± 8 kV Air Discharges	N/A
	± 4 kV Direct Contact Discharges	A
EN6100-4-3:1995	6 V/m, 80 to 1000 MHz, 80 % AM modulation	A
ENV50204: 1995	900±5 MHz, 3 V/m, Pulsed RF Immunity	A
EN6100-4-4:1995	± 1 kV Power line	A
	± 500 V Data lines	N/A
EN61000-4-5:1995	± 2 kV between AC L/G, N/G ± 1 kV between L/N	B
EN61000-4-6:1996	3 Vrms, 0.15 to 80 MHz	A
EN61000-4-11:1994	> 95 % reduction for 10 ms, criteria B	A
	30 % reduction for 500 ms, criteria C	A
	>95 % reduction for 5 s, criteria C	C

On , The Matrox Conformity Group was accredited by the American Association for Laboratory Acrreditation (A2LA) to perform test according to the FCC and EN55022 requyirements in radiated and Conducted emissions. (A2LA Certification Number 993.01). On the Matrox Conformity Group has expanded its scope of accreditation to include all the standards listed in the executive summary (section 0 of this report).

FOR RADIATED, CONDUCTED EMISSIONS AND IMMUNITY TESTS

Members who participated in this project

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2 GENERAL INFORMATION

2.1 Product Description

Description of the equipment under test:

The Matrox RT2000/KIT/N has a top level number 20029-01-00 and it is a realtime nonlinear editing system. It is composed of :

1) PCB 1: RT2000, 895-01 Rev.: A S/N: AN62787
2) PCB 2: G4+MMDHA/32G, 906-02 Rev.: A S/N: AP25135

Consult the attached user's manual for more information about technical description.

Tested Mode: DV LOOP

Osc/Clock Frequencies:

Oscillator: 24.60MHz, 27.00MHz, 27.50MHz.

Power Requirements: From PC

2.2 Related Declaration Of Conformity

This report is kept in Matrox Conformity Group and is used as a reference for issuing Verification reports according to the FCC requirements or Declarations of Conformity according to European, Australian, VCCI and any other equivalent requirements.

2.3 Tested System Details

The EUT was received on in good condition. The FCC Ids for the support equipment are listed in Table 1. The description of all cables used in the tested system appears in figure 3.1 of section 3.5.

Table 1 Listing of equipment used

DESCRIPTION	MANUFACT	MODEL	SERIAL NO	FCC ID	SUPPLY CABLE	I/O CABLE
COMPUTER	INTERGRAPH	TD260 700563000	C92DK101715	DOC	1.2m Not Shielded	N/A
MONITOR	IBM	P202 , 6558-03N	55-24971	AK8GDM500PS	1.8m, not shielded	1.8m, HD15, shielded, 2 ferrites
KEYBOARD	NMB	RT2358TW	30991167	AQ6-23K15	N/A	N/A
MOUSE	LOGITECH	M-S48	4862A096	DZL211150	N/A	N/A
SPEAKERS	ALTEC LANSING	ACS90	80679	DOC	15Vdc Adaptor	1/8 stereo shielded cables
VIDEO DISC PLAYER	SONY	LPD3600D	100104	AK8LPD3600D	1.2m, not shielded	2m, shielded phono cables
CALCULATOR	HP	48GX	ID81004567	N/A	N/A	1.5m, shielded, one ferrite, DB-9
SUPERDISK	IMATION	LS-120 11795	AW981281301	DOC	5Vdc Adaptor	1m, Shielded DB25 to DB25
VIDEO CAMERA	SONY	DCR-TRV9	237112	DOC	AC ADAPTER	IEEE-1394, 6 FEET, DOUBLE SHIELD
Break Out BOX	MATROX	MARVEL	AAR79249	DOC	N/A	See EUT
VIDEO CARD	MATROX	0906-02 Rev.: A	AP25135	DOC	PC HOST	1.5m HD-15/HD-15 Shielded
CODEC CARD (1)	MATROX	0895-01 Rev.: A	AN62787	N/A	PC HOST	Mrvrt/Bob/Cbl, HD26 shielded cable.,1.3m 1394 ports shielded cables, 2.5m

(1) EUT

2.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in FCC CFR 47 and ANSI C63.4-1992 (except for sections 5.7, 9 and 14 which are not recognized by the FCC «ref. CFR 47, article 15.31(6)»). Before the testing, some investigations are done in different modes to determine the worst mode. The worst mode is used to collect final data. Radiated testing was performed at an antenna to EUT distance of 3 meters. All antenna factors were accurate at ± 2dB. Investigations of emissions up to 2 GHz were performed for this product.

Radiated Emissions Measurement: The first step in radiated measurement is to select the worst mode of emissions. This is done by installing the EUT in the semi-anechoic room on an 80 cm wooden table at 3 meters from the receiving antenna. A complete scan in a first band from 30 MHz to 1 GHz (or 2 GHz, depending of the frequency of operation of the EUT) is performed and the EMI receiver curve is saved. The EUT is then configured to a second mode and the same measurement is performed and data is saved. This process goes on for each mode of operation until all the EMI signatures are collected. Test personnel then compare the data curves for all modes and a final decision is taken on the mode that produces the most powerful emissions. This mode is then selected for all subsequent tests and the EUT is set up in the worst case mode of operation. Using this mode, investigations are done to maximize the emissions by moving the cables within the range of the test set-up described in ANSI C63.4: 1992. After this maximization process, a pre-scan is performed using the H.P. 85876A commercial radiated emissions measurement software. In pre-scan, we selected the following test sequence.

The 30 MHz to 1 GHz frequency band is separated in 2 frequency segments. For each segment, the antenna is moved to two different heights: 1 and 3 meters. At each height and for both polarizations, the table is turned 360 degrees in a continuous fashion. For each segment, the software built a numerical table of all the frequencies detected; this process is done using a peak detector and a 120 kHz bandwidth. Since the pre-scan is performed is an EMI protected environment, all the frequencies of the pre-scan are generated by the setup. From that point, we perform a data processing and we keep all the detected frequencies, which are at – 6 dB or less form the selected limit. For frequencies over 1 GHz, all detected frequencies form a wide band scan are selected for final maximization with special care taken to set the receiver band width to 1 MHz.

The final measurement is performed at each frequency of interest and at that time the antenna is moved continuously from 1 to 4 meters in both polarizations and the turn table moves 360 degrees to find the combination of height, polarization and orientation that produces the highest emission. Once the geometrical parameters are set, the final measurement takes places using a Quasi-peak detector. This result is then compare to the selected limit for final reporting.

Conducted Emissions measurements: The conducted emissions measurements are performed in our semi-anechoic chamber. A movable vertical plane is put in place at 40-cm from the back of the EUT and bonded to the shielded room metallic floor. The EUT stands on an 80-cm wooden table. Power is fed to the EUT through a 50 Ω / 50 μH Line Impedance Stabilization Network (EUT LISN). The EUT LISN receives its power from AC filters installed on the exterior surface of the semi-anechoic chamber. A second LISN, the peripheral LISN, provides power and isolation to peripherals. This LISN also gets its power through AC filters. All filters and LISNs are bounded to the metallic enclosure ground.

The 50 Ω output of the EUT LISN is connected to the EMI receiver, which has an internal current limiting filter, which is used to prevent overload of the receiver from noise transients. The frequency range investigated is from 150 kHz to 30 MHz (which includes both FCC and CISPR 22 bands) and the receiver bandwidth is set to 9 kHz. A first scan is performed in peak mode and maximum emissions are selected, maximized by moving the cable within the range of the test set-up described in ANSI C63.4: 1992, and finally measured in quasi-peak for final reporting.

Uncertainty Statement: The Matrox Conformity Group performs all its testing in a laboratory studied and listed by the American Federal Communications Commission (FCC). Our radiated test site meets the requirements of ANSI C63.4: 1992 and EN55022: 1995 for Normalized Site Attenuation within the ± 4 dB criteria. All testing apparatus used for final testing are calibrated at the time of testing and they all meet the requirements of CISPR 16-1:1993 and ANSI C63.2: 1987. Therefore the Matrox Conformity Group consider that no additional uncertainty indication is needed.

2.5 Test Facility

The semi-anechoic test site and conducted measurement facility used to collect the radiated data is located at 1055 St. Regis Boulevard in Dorval, (Quebec) Canada. This site has been fully described in a report dated submitted to FCC Laboratory, Authorization and Evaluation Div. And accepted in a letter dated (31040/SIT: 1300F2).

On , The Matrox Conformity Group was accredited by the American Association for Laboratory Acrreditation (A2LA) to perform test according to the FCC and EN55022 requyirements in radiated and Conducted emissions. (A2LA Certification Number 993.01). On the Matrox Conformity Group has expanded its scope of accreditation to include all the standards listed in the executive summary (section 0 of this report).

FOR RADIATED, CONDUCTED EMISSIONS AND IMMUNITY TESTS

2.6 List of the Test Equipment

The following list contains equipment used at Matrox Electronic Systems Laboratory for testing. The calibration and adjustments of the measuring instruments are checked frequently to assure their accuracy. Independent laboratories perform the calibration of these instruments at least once a year except for specific instrument as noted.

Table 2 Listing of test equipment used

Name	Manufacturer	Model	Serial #	Cal. Due Date	Used
Semi-Anechoic Chamber	EMC Test System	AP00025	11381		☒
EMI Receiver	Hewlett Packard	8546A	3801A00425		☒
RF Filter section	Hewlett Packard	85460A	3704A00330		☒
EMI Receiver	Hewlett Packard	8542E	3617A00169		☒
RF Filter section	Hewlett Packard	85420E	3427A00153		☒
Biconilog Antenna	EMCO	3142	9606-1041		☒
Biconilog Antenna	CHASE	CBL6112A	2277		☐
Biconilog Antenna	CHASE	CBL6112B	2410		☒
Muti-Device Controller	EMCO	2090	9605-1134		☒
Muti-Device Controller	EMCO	2090	9605-1135		☒
Antenna Tower	EMCO	2070	9606-1974		☒
Antenna Tower	EMCO	2070	9606-1973		☒
Turntable	EMCO	2081	9605-1897		☒
Turntable	EMCO	2065	9605-1890		☒
Power Meter	Hewlett Packard	437B	3125U24265		☒
Power Sensor	Hewlett Packard	8442A	3318A29448		☒
Signal Generator	Rohde&Schwarz	SMY01	DE15017		☒
Function Generator	B&K Precision	3010	8739380		☒
RF Amplifier	Amplifier Research	30W1000M7	20720		☒
RF Amplifier	Amplifier Research	25A250A	20666		☒
Directional Coupler	Werlatone	02630	5584		☒
LISN	Solar Electronics	8012-50-R-24-BNC	887185		☒
LISN	Solar Electronics	8012-50-R-24-BNC	935435		☒
LISN	EMCO	3816/2	9605-1042		☒
Power Analyzer	AV Power	PA2200	605-0297		☒
Reference Impedance	AV Power	Option 48	606-0297		☒
AC Power Source	California Instruments	1251P	L05214		☒
EMC Test Instrument	Schaffner	Best '96 V3.9	IN4696-011		☒
Coupling Clamp	Schaffner	CDN 125	661		☐
Coupling Clamp	CHASE	CIC-8110	04		☐
ESD Gun	Schaffner	N/A	NR224		☒

3 PRODUCT LABELING

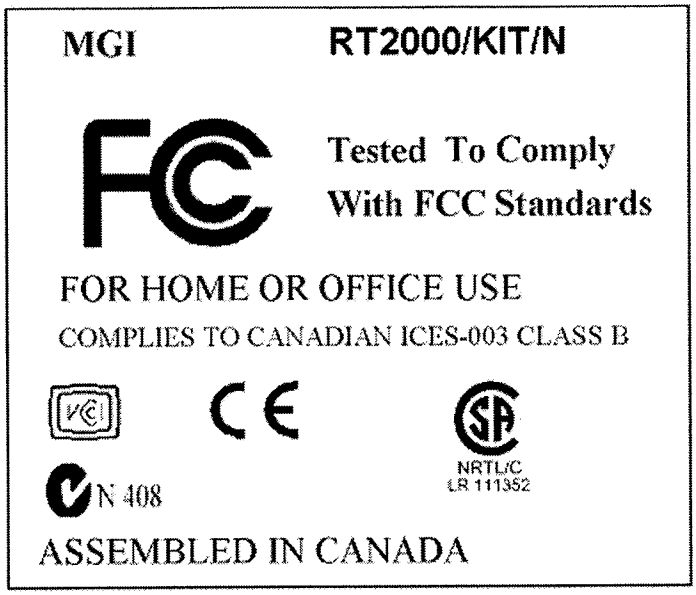


Figure 2.1 FCC Class B and CE Label

The label shown in Figure 2.1 is a copy of the production label that will installed on the board upon the Verification based on the results of this report. Please note that, depending of the marketing of a particular version of this product, some marks might not appear on the label. A copy of these notice and compliance statement required by the FCC will be provided with each device sold. This label will be permanently affixed to the device as shown in the label placement drawing (fig. 2.2).

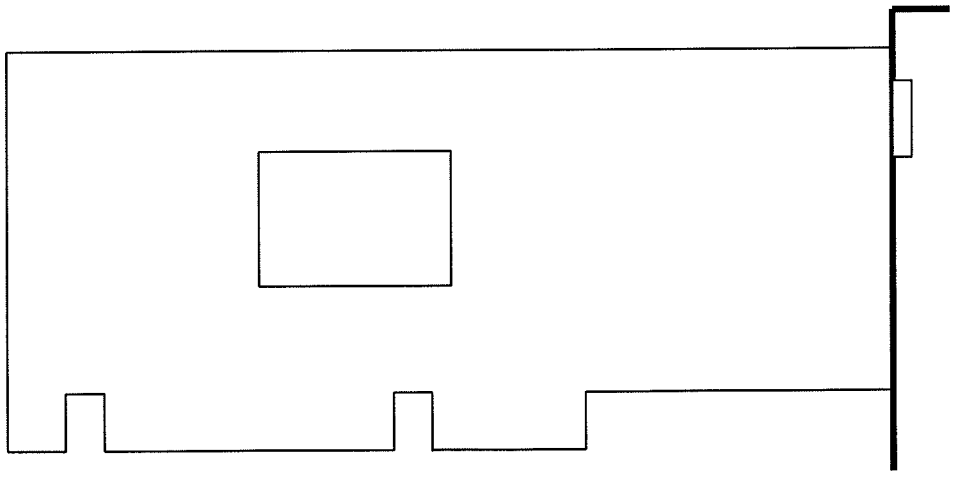


Figure 2.2 Location of label on EUT

4 SYSTEM TEST CONFIGURATION

4.1 Justification

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The tabletop system was placed according to section 11.2 of ANSI and cables were placed and manipulated in essence of ANSI C63.4, parag 11.2.4.

The system was tested in 1 mode, DV LOOP. The worst mode is the one that produces the emissions that have the highest amplitude relative to the limit. This mode was used to collect the reported data. The worst case of emissions was investigated according to the sections 11.5 for AC power line conducted emission tests and 11.6 of ANSI C63.4-1992 for radiated emissions tests.

4.2 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use as specified in section 11.1 of ANSI C63.4-1992. The software, contained on the hard-disk of the PC host, once loaded, the program sequentially exercises each system component in turn. The sequence used is:

- Scrolling H pattern.
- Copy a file of H from hard disk to the floppy disk.
- Copy a file of H from hard disk to the super disk.
- Receive an H file from a calculator.
- Play an audio CD.

4.3 Special Accessories

No special accessory was needed or added to meet the requirements of the FCC class B digital devices and immunity requirements.

4.4 Equipment Modifications

Statement of Manufacturer's Representative

I hereby warrant that the test sample is representative of the product to be marketed, that the test system configuration is representative of the product's intended use, and that during the testing the test sample was functioning and being exercised in a manner typical of its intended use.

Any change in production units will require prior review by the Matrox Conformity Group

Confirmed by:

Applicant Signature: _____ Date:____/_____/
Typed/Printed Name: Michel Bourgeois, Product Responsible.

4.5 Configuration of Tested System

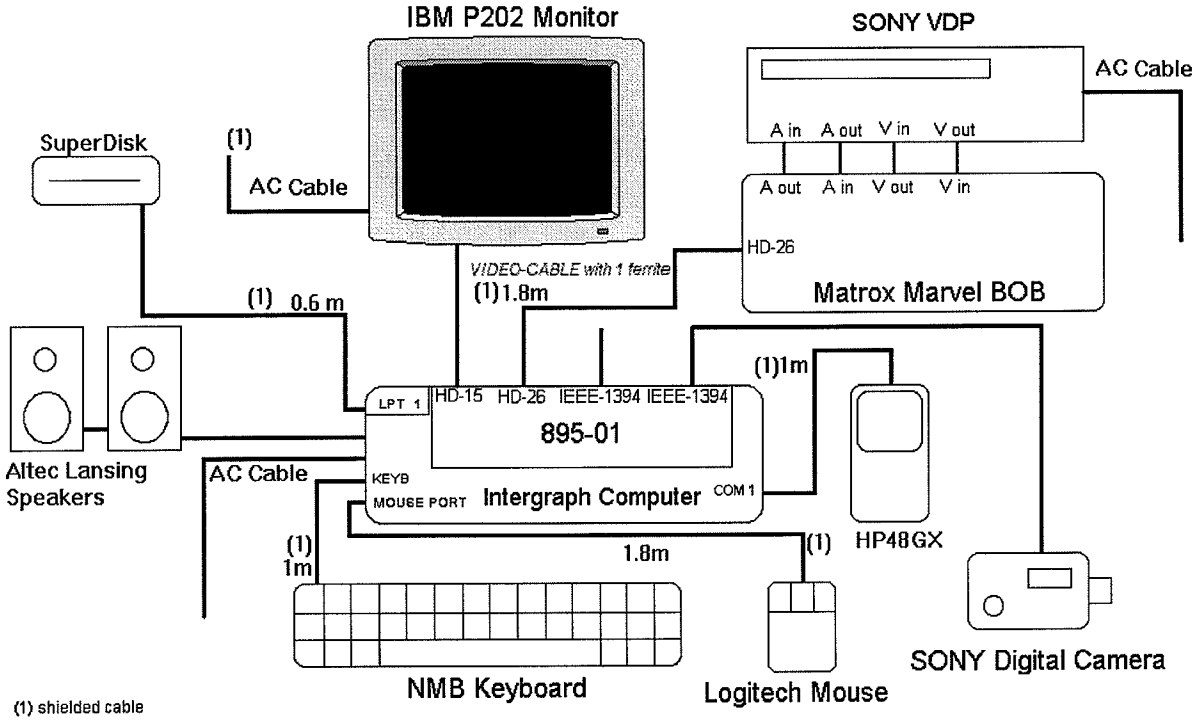


Figure 3.1 Configuration of Tested System

5 BLOCK DIAGRAM(S) OF EUT

5.1 Block Diagram Description of the Graphic board

Figure 4.1 depicts the block diagram of the RT2000/KIT/N board:

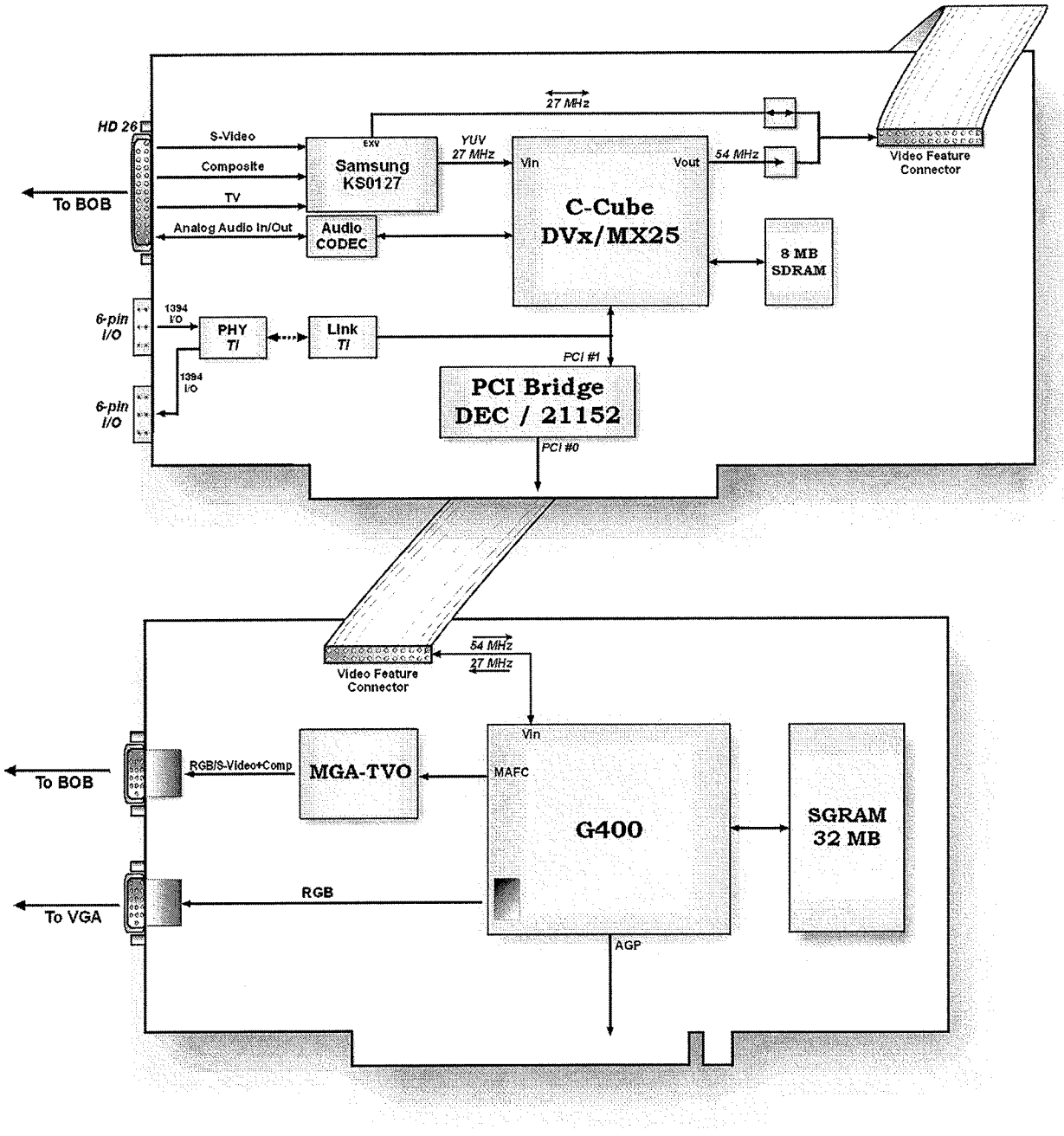


Figure 4.1 Block Diagram of EUT

6 CONDUCTED AND RADIATED MEASUREMENT PHOTOS

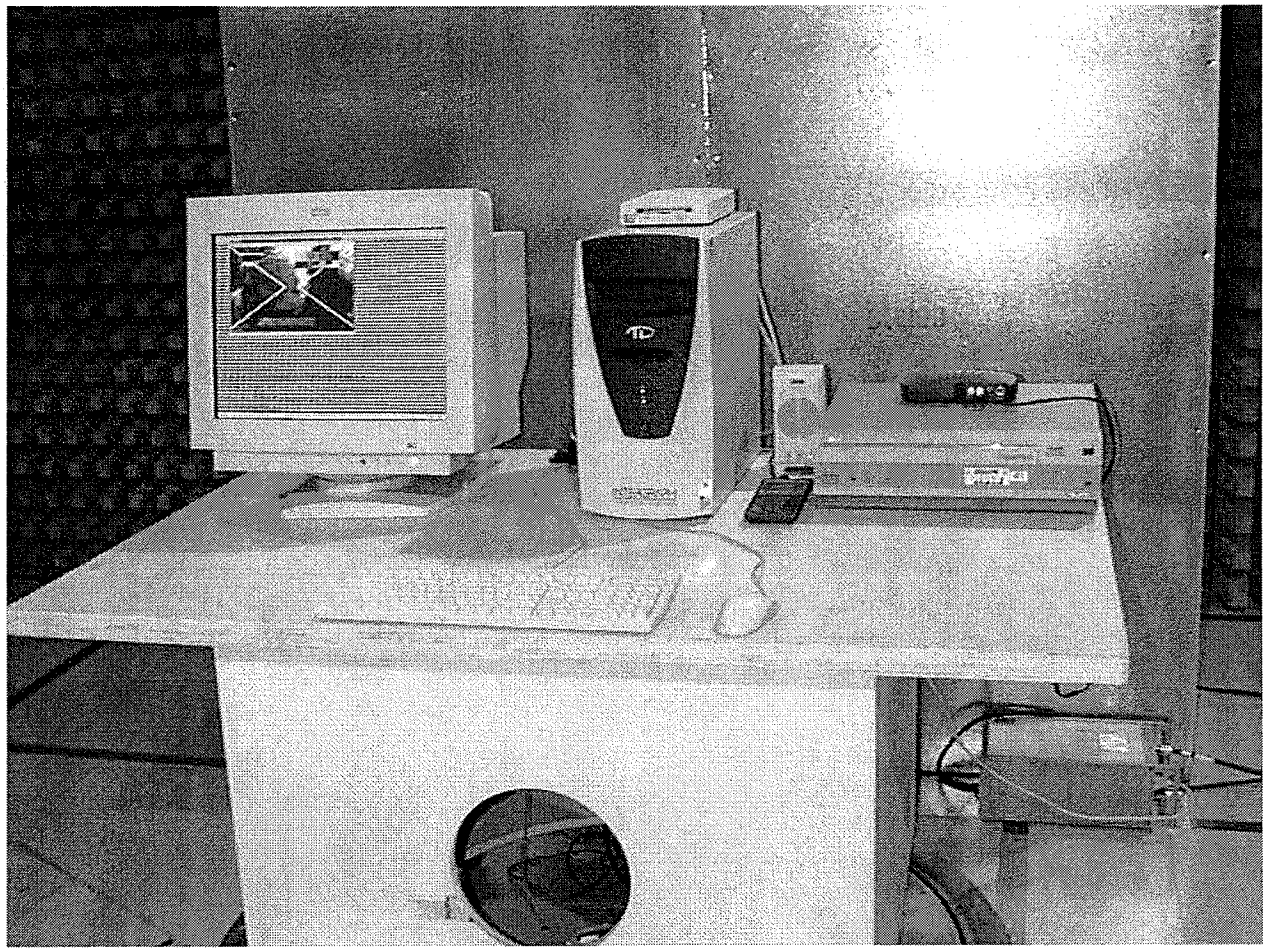


Figure 5.1 Front conducted picture

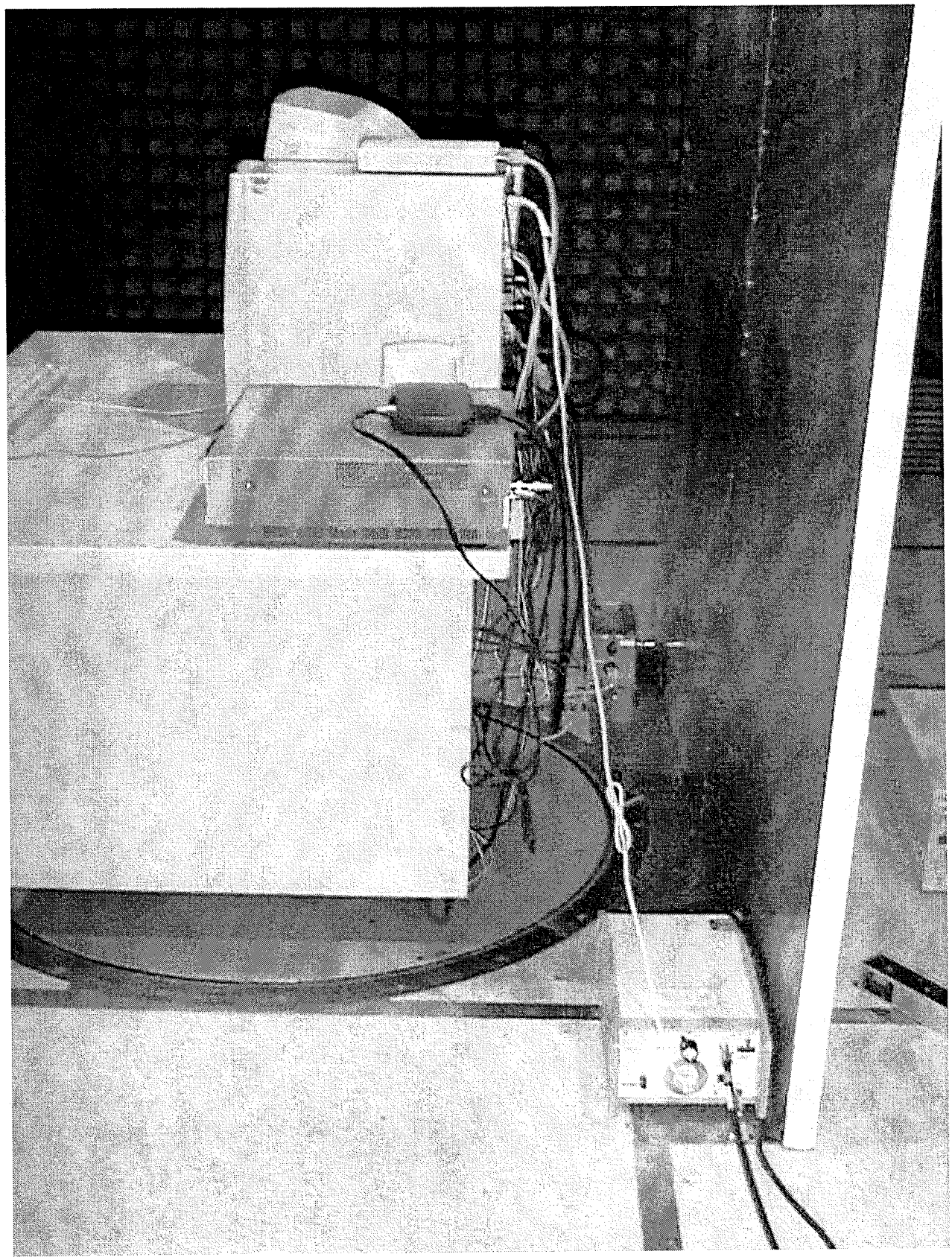


Figure 5.2 Rear conducted picture

Figure 5.3 Front radiated picture at 3m

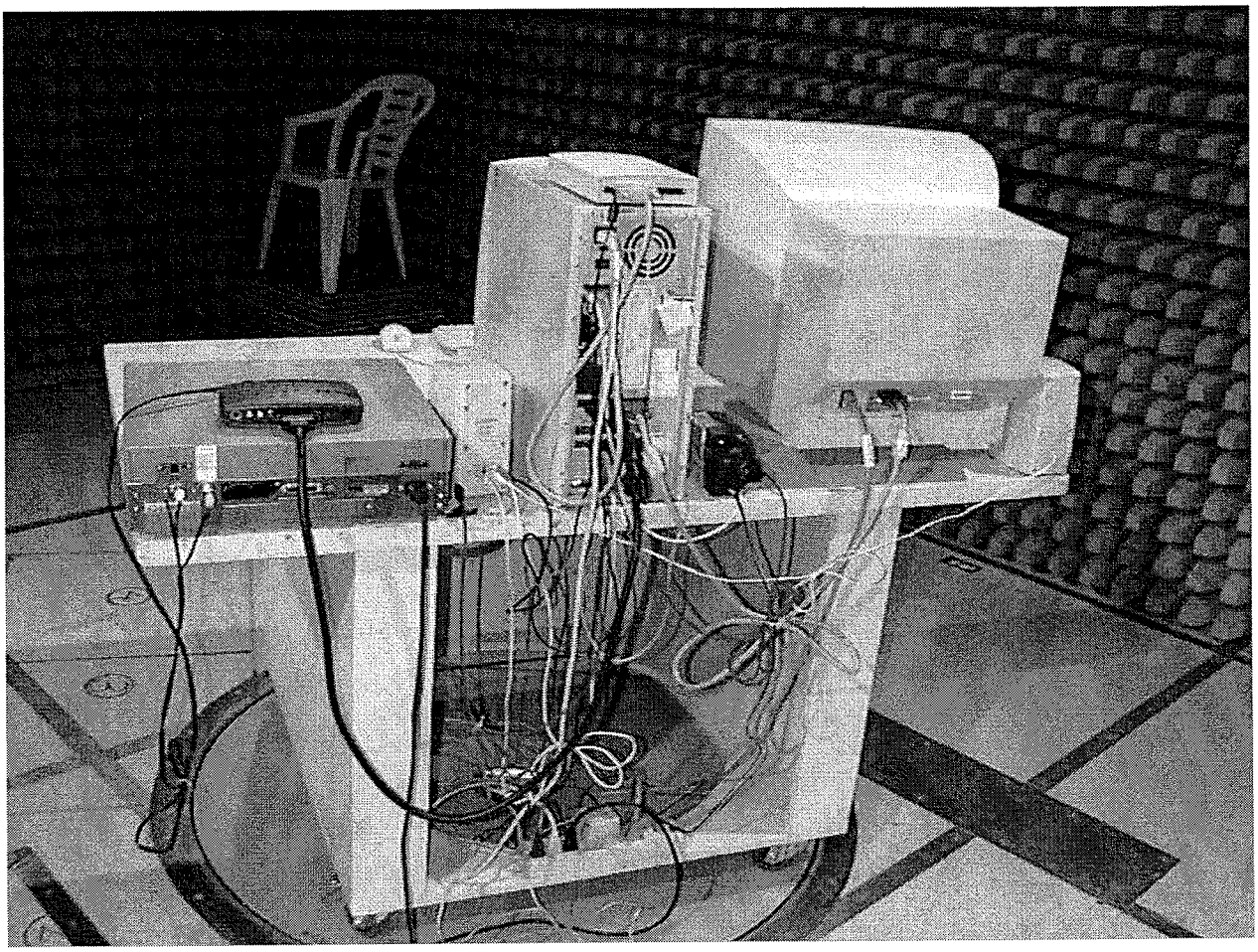


Figure 5.4 Rear radiated picture at 3 m

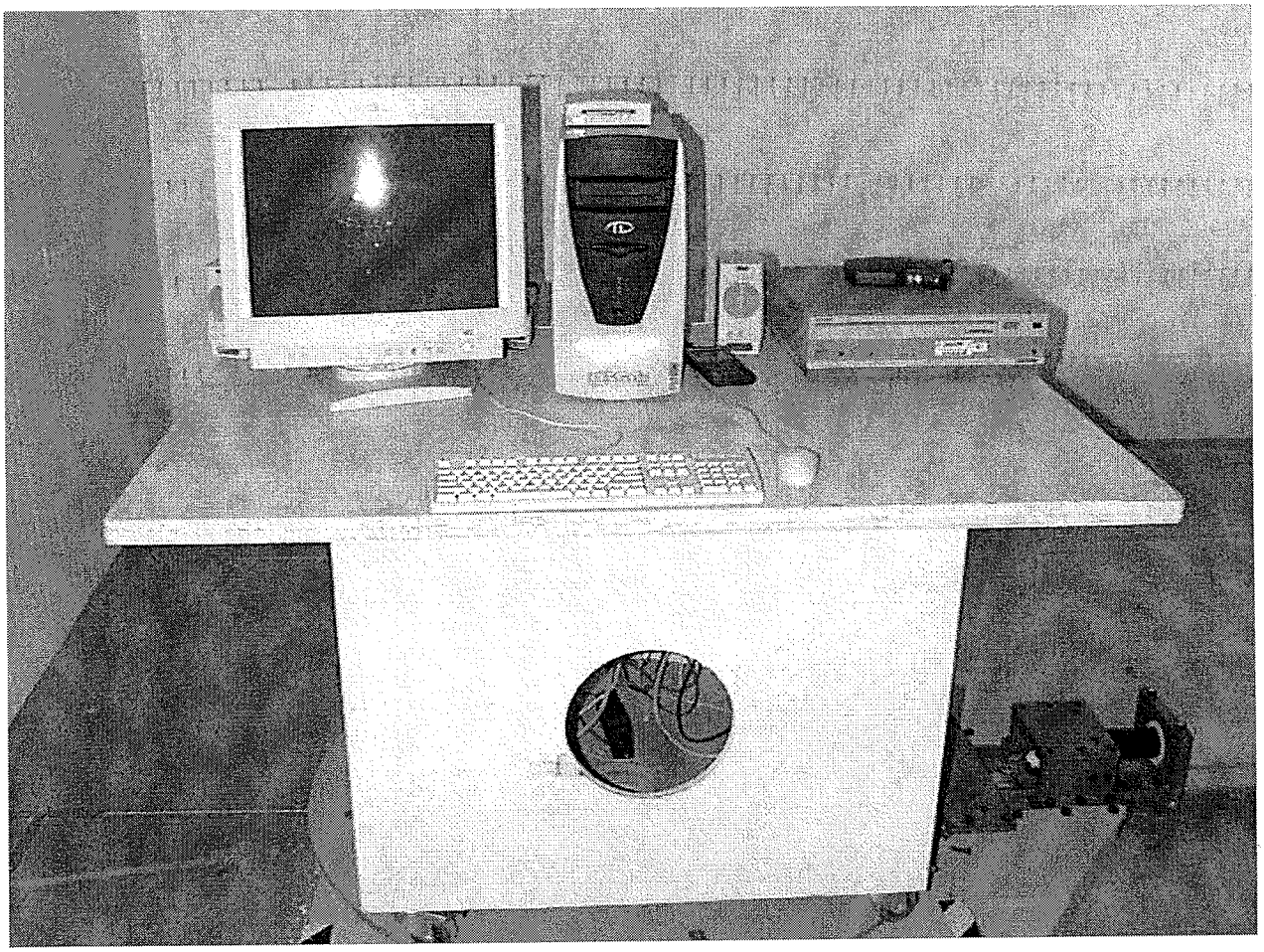


Figure 5.5 Front radiated picture at 10 m

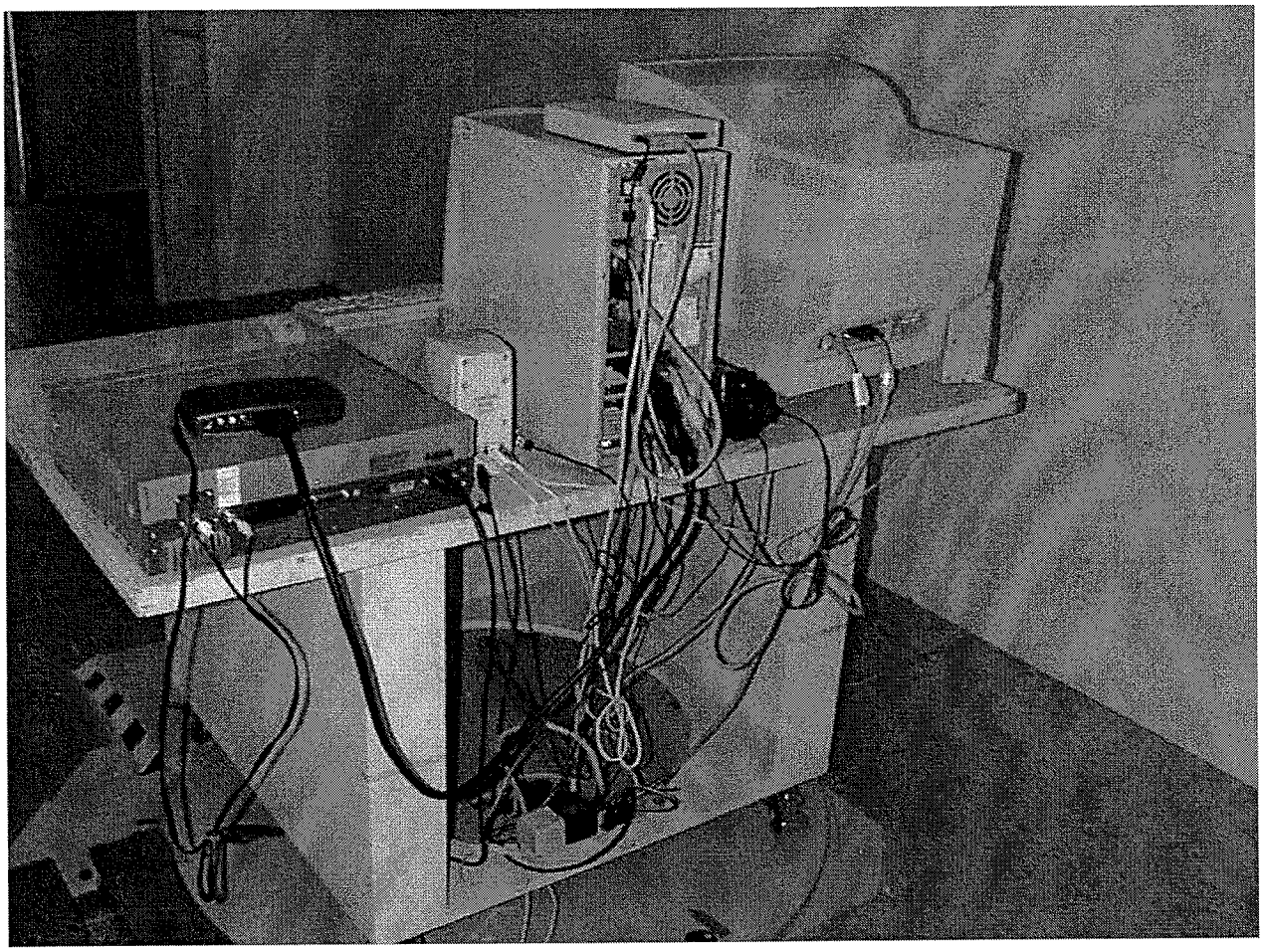


Figure 5.6 Rear radiated picture at 10 m

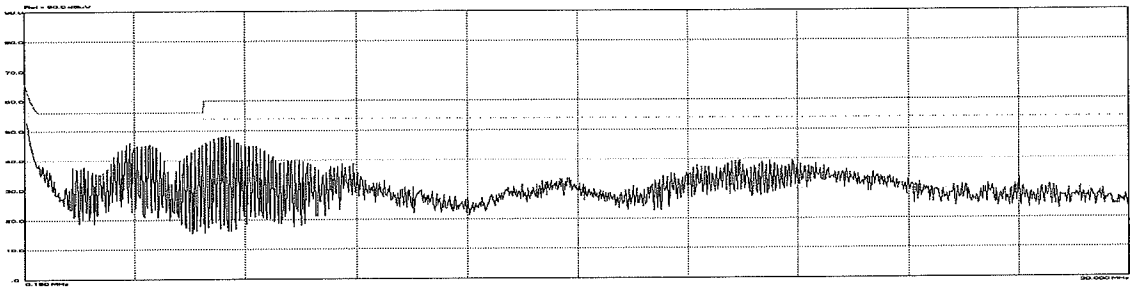
7 CONDUCTED EMISSION DATA IN THE WORST MODE

The worst mode is DV LOOP. Note: Insertion losses by the testing cable and the EUT LISN are set two 2 dB on the entire range.

~~0.1~~7.1 EN55022 Limit

The following data lists the significant emission frequencies with their amplitude and their margin of compliance. Numbers with a minus sign are below the EN55022 conducted emission limit. The EUT was powered at 230 Vac/50 Hz.

~~0.1.1~~7.1.1 Graphic (peak measurement)



~~0.1.2~~7.1.2 Data Line 1

Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Lim (dBuV)	ΔL-QP (dB)	Avg (dBuV)	Avg Lim (dBuV)	ΔL-Avg (dB)	Status
0.158312	54.69	50.13	65.59	-15.46	37.00	55.59	-18.60	PASS
0.168175	52.99	48.80	65.11	-16.31	19.53	55.11	-35.59	PASS
0.181732	51.09	47.21	64.45	-17.24	17.25	54.45	-37.21	PASS
0.197298	52.48	45.57	63.76	-18.19	26.30	53.76	-27.46	PASS
0.208676	48.90	46.42	63.32	-16.90	42.78	53.32	-10.54	PASS
0.224989	49.18	43.11	62.69	-19.58	16.10	52.69	-36.59	PASS
0.248661	46.72	41.21	61.83	-20.62	11.30	51.83	-40.53	PASS
0.250579	46.61	41.02	61.77	-20.75	11.02	51.77	-40.75	PASS
0.265928	46.30	40.05	61.31	-21.25	19.15	51.31	-32.16	PASS
0.274794	45.17	39.70	61.04	-21.34	27.47	51.04	-23.57	PASS
0.281876	43.70	38.83	60.82	-22.00	18.31	50.82	-32.51	PASS
2.896388	43.98	43.59	56.00	-12.41	42.36	46.00	-3.64	PASS
3.002206	44.53	44.53	56.00	-11.47	42.06	46.00	-3.94	PASS
3.207532	44.01	43.65	56.00	-12.35	43.13	46.00	-2.87	PASS
3.311094	43.84	43.83	56.00	-12.17	43.50	46.00	-2.50	PASS
3.414520	44.01	44.03	56.00	-11.97	43.82	46.00	-2.18	PASS
3.519445	44.30	44.22	56.00	-11.78	43.71	46.00	-2.29	PASS
3.623007	44.16	43.89	56.00	-12.11	43.30	46.00	-2.70	PASS
4.967720	43.63	43.59	56.00	-12.41	43.13	46.00	-2.87	PASS
5.070093	44.25	44.28	60.00	-15.72	44.14	50.00	-5.86	PASS
5.172521	44.76	44.83	60.00	-15.17	44.62	50.00	-5.38	PASS
5.278609	45.55	45.41	60.00	-14.59	44.86	50.00	-5.14	PASS

Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Lim (dBuV)	ΔL-QP (dB)	Avg (dBuV)	Avg Lim (dBuV)	ΔL-Avg (dB)	Status
5.380076	45.92	45.89	60.00	-14.11	45.67	50.00	-4.33	PASS
5.486475	46.14	46.04	60.00	-13.96	44.92	50.00	-5.08	PASS
5.589077	46.12	46.31	60.00	-13.69	45.78	50.00	-4.22	PASS
5.692638	46.16	45.96	60.00	-14.04	45.34	50.00	-4.66	PASS
5.794863	45.60	45.11	60.00	-14.89	44.89	50.00	-5.11	PASS
5.897195	43.98	44.04	60.00	-15.96	43.80	50.00	-6.20	PASS
6.000554	43.56	43.21	60.00	-16.79	42.84	50.00	-7.16	PASS
6.310688	43.16	42.62	60.00	-17.38	41.86	50.00	-8.14	PASS

~~0.1.3~~7.1.3 Data Line 2

Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Lim (dBuV)	ΔL-QP (dB)	Avg (dBuV)	Avg Lim (dBuV)	ΔL-Avg (dB)	Status
0.160331	54.94	50.22	65.50	-15.28	31.81	55.50	-23.68	PASS
0.172615	53.11	48.50	64.90	-16.40	21.22	54.90	-33.68	PASS
0.189250	52.15	46.60	64.09	-17.48	18.87	54.09	-35.22	PASS
0.199155	51.18	45.43	63.69	-18.25	22.89	53.69	-30.80	PASS
0.229452	50.16	43.08	62.52	-19.44	25.55	52.52	-26.97	PASS
0.246625	47.36	41.53	61.89	-20.36	19.66	51.89	-32.23	PASS
0.251437	46.61	41.27	61.74	-20.47	19.28	51.74	-32.46	PASS
0.273265	45.12	40.89	61.08	-20.19	32.80	51.08	-18.28	PASS
2.897145	45.12	44.73	56.00	-11.27	43.52	46.00	-2.48	PASS
3.000693	45.90	45.97	56.00	-10.03	43.69	46.00	-2.31	PASS
3.208181	44.86	44.77	56.00	-11.23	44.24	46.00	-1.76	PASS
3.310459	44.78	44.85	56.00	-11.15	44.67	46.00	-1.33	PASS
3.415102	45.03	45.12	56.00	-10.88	44.86	46.00	-1.14	PASS
3.518554	45.38	45.29	56.00	-10.71	45.04	46.00	-0.96	PASS
3.622116	44.93	44.96	56.00	-11.04	44.79	46.00	-1.21	PASS
4.969341	45.28	44.97	56.00	-11.03	43.46	46.00	-2.54	PASS
5.072512	45.85	45.81	60.00	-14.19	44.56	50.00	-5.44	PASS
5.175899	46.44	46.47	60.00	-13.53	45.34	50.00	-4.66	PASS
5.276406	47.29	47.14	60.00	-12.86	47.00	50.00	-3.00	PASS
5.380319	47.58	47.60	60.00	-12.40	47.48	50.00	-2.52	PASS
5.485516	47.86	47.93	60.00	-12.07	47.53	50.00	-2.47	PASS
5.587347	48.04	48.11	60.00	-11.89	47.98	50.00	-2.02	PASS
5.691111	47.98	47.78	60.00	-12.22	47.61	50.00	-2.39	PASS
5.795443	47.01	47.04	60.00	-12.96	46.61	50.00	-3.39	PASS
5.898843	45.90	46.09	60.00	-13.91	45.67	50.00	-4.33	PASS
6.000688	45.28	45.17	60.00	-14.83	44.96	50.00	-5.04	PASS
6.103169	44.82	44.72	60.00	-15.28	44.07	50.00	-5.93	PASS
6.309432	44.78	44.06	60.00	-15.94	43.04	50.00	-6.96	PASS
6.414709	44.82	44.53	60.00	-15.47	44.27	50.00	-5.73	PASS

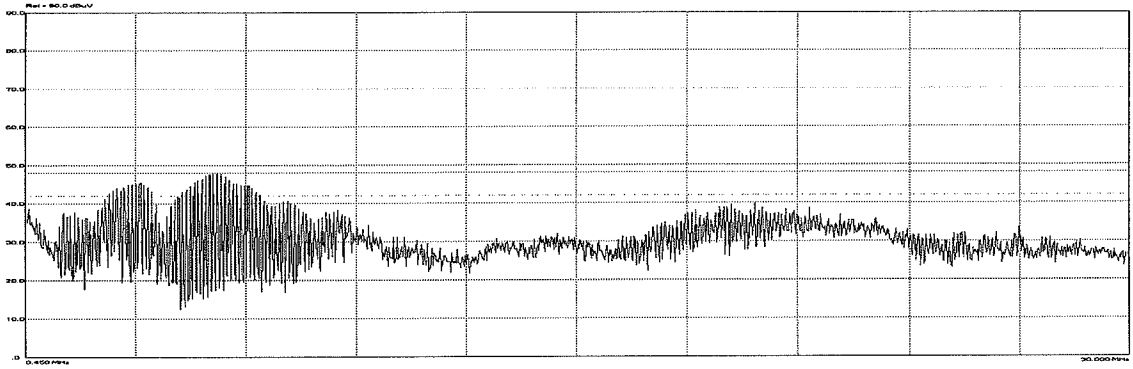
Worst Mode: DV LOOP **Judgment**: Passed Conducted test EN55022 Class B by 0.96dB

TEST PERSONNEL:
Tester Signature: _____ Date: ___/___/
Typed/Printed Name: Vianney Saindon, EMI Specialist.

7.2 FCC Limit

The following data lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the FCC B conducted emission limit. The EUT was powered at 120 Vac/60 Hz.

~~0.1.1~~7.2.1 Graphic (peak measurement)



~~0.1.2~~7.2.2 Data Line 1

Frequency (MHz)	Peak (dBuV)	QP Lim (dBuV)	ΔL-Pk (dB)	Status
2.592375	41.29	48.00	-6.71	PASS
2.698755	42.19	48.00	-5.81	PASS
2.802180	43.02	48.00	-4.98	PASS
2.893785	43.34	48.00	-4.66	PASS
2.997210	42.58	48.00	-5.42	PASS
3.103590	42.88	48.00	-5.12	PASS
3.207015	44.01	48.00	-3.99	PASS
3.313395	43.80	48.00	-4.20	PASS
3.416820	44.05	48.00	-3.95	PASS
3.520245	44.41	48.00	-3.59	PASS
3.626625	44.16	48.00	-3.84	PASS
3.727095	43.20	48.00	-4.80	PASS
3.833475	41.96	48.00	-6.04	PASS
4.764300	42.10	48.00	-5.90	PASS
4.864770	42.72	48.00	-5.28	PASS
4.971150	43.75	48.00	-4.25	PASS
5.077530	44.12	48.00	-3.88	PASS
5.269605	45.38	48.00	-2.62	PASS
5.375985	45.85	48.00	-2.15	PASS
5.479410	46.12	48.00	-1.88	PASS
5.585790	46.44	48.00	-1.56	PASS
5.692170	45.99	48.00	-2.01	PASS
5.798550	45.05	48.00	-2.95	PASS
5.899020	43.89	48.00	-4.11	PASS
6.005400	43.20	48.00	-4.80	PASS
6.108825	42.93	48.00	-5.07	PASS
6.212250	43.06	48.00	-4.94	PASS
6.318630	42.95	48.00	-5.05	PASS

Frequency (MHz)	Peak (dBuV)	QP Lim (dBuV)	ΔL-Pk (dB)	Status
6.410235	42.67	48.00	-5.33	PASS
6.513660	41.70	48.00	-6.30	PASS

~~0.1.3~~7.2.3 Data Line 2

Frequency (MHz)	Peak (dBuV)	QP Lim (dBuV)	ΔL-Pk (dB)	Status
2.802180	43.39	48.00	-4.61	PASS
2.893785	44.12	48.00	-3.88	PASS
2.997210	43.39	48.00	-4.61	PASS
3.103590	44.23	48.00	-3.77	PASS
3.207015	44.93	48.00	-3.07	PASS
3.313395	44.91	48.00	-3.09	PASS
3.416820	45.07	48.00	-2.93	PASS
3.520245	45.42	48.00	-2.58	PASS
3.626625	44.91	48.00	-3.09	PASS
3.727095	44.25	48.00	-3.75	PASS
3.833475	43.13	48.00	-4.87	PASS
4.657920	42.93	48.00	-5.07	PASS
4.764300	43.54	48.00	-4.46	PASS
4.867725	44.50	48.00	-3.50	PASS
4.974105	45.48	48.00	-2.52	PASS
5.077530	45.99	48.00	-2.01	PASS
5.272560	47.20	48.00	-0.80	PASS
5.375985	47.60	48.00	-0.40	PASS
5.482365	47.95	48.00	-0.05	PASS
5.585790	47.95	48.00	-0.05	PASS
5.689215	47.63	48.00	-0.37	PASS
5.795595	47.04	48.00	-0.96	PASS
5.901975	46.19	48.00	-1.81	PASS
6.008355	45.10	48.00	-2.90	PASS
6.108825	45.14	48.00	-2.86	PASS
6.215205	44.78	48.00	-3.22	PASS
6.321585	44.64	48.00	-3.36	PASS
6.410235	44.71	48.00	-3.29	PASS
6.516615	43.98	48.00	-4.02	PASS
6.620040	42.93	48.00	-5.07	PASS

Worst Mode: DV LOOP

Judgment: Passed Conducted test by FCC Class B by 0.05dB

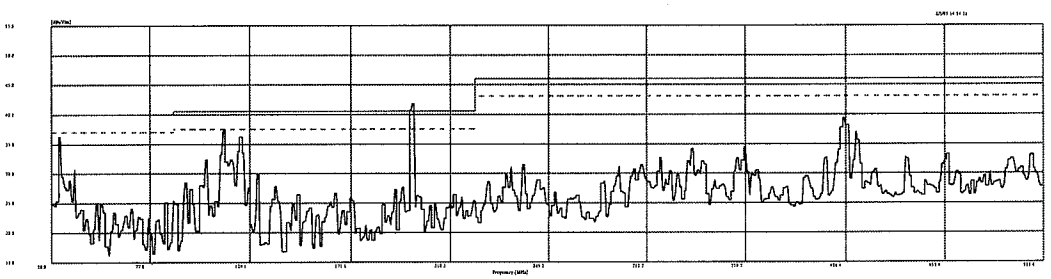
TEST PERSONNEL:
Tester Signature: _____ Date: ___/___/
Typed/Printed Name: Vianney Saindon, EMI Specialist.

8 RADIATED EMISSION DATA IN THE WORST MODE

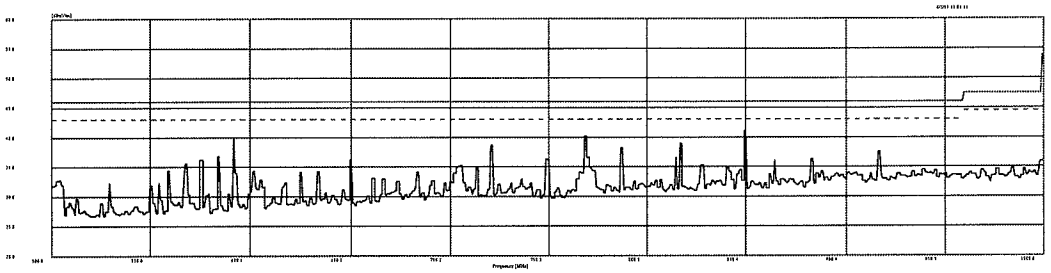
8.1 Listing of significant emissions frequencies FCC Class B

The following data lists the significant emission frequencies in the semi-anechoic site, the limit and the margin of compliance. Numbers with a minus sign are below the worst case of the FCC class B limits at 3 meters. The EUT was powered at 120 Vac/60 Hz.

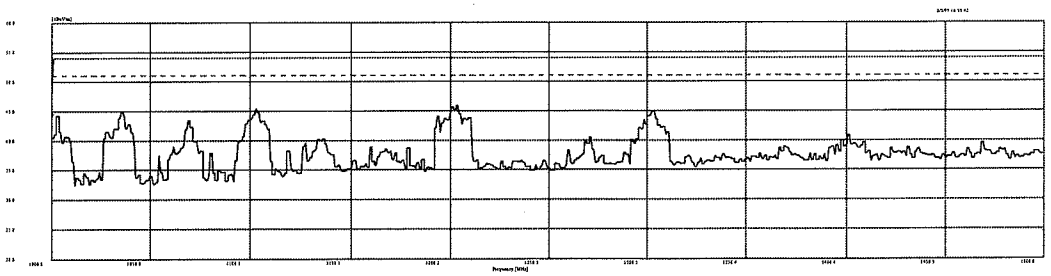
~~0.1.1~~8.1.1 Graphic from 30MHz to 500MHz(peak measurement)



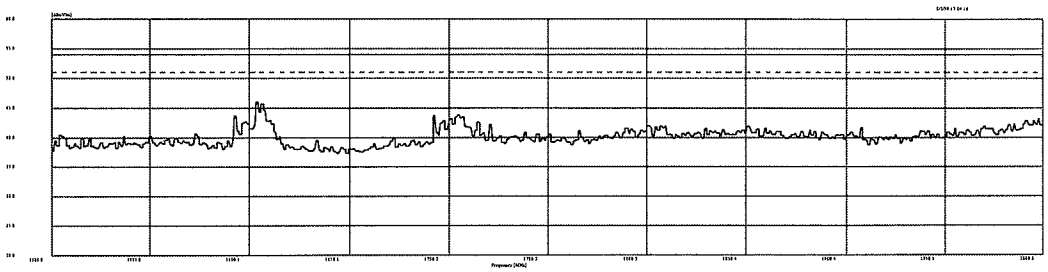
8.1.2 Graphic from 500MHz to 1000MHz(peak measurement)



8.1.3 Graphic from 1000MHz to 1500MHz(peak measurement)



8.1.4 Graphic from 1500MHz to 2000MHz(peak measurement)



~~0.1.2~~8.1.5 Data from 30 to 1000 MHz

Frequency	Hgt	Ang	Pol	Cab	Ant F	Tot C	QP	QP Lmt	ΔL-QP	Status
MHz	cm	deg		dB	dB/m	dB	dBuV/m	dBuV/m	dB	
33.391136	202	202	Vert	0.01	16.49	16.51	32.32	40.00	-7.68	PASS
114.560077	281	112	Horz	0.27	8.13	8.40	23.23	43.50	-20.27	PASS
118.141177	265	67	Horz	0.26	7.91	8.18	32.43	43.50	-11.07	PASS
196.622852	100	235	Vert	0.46	11.37	11.82	32.38	43.50	-11.12	PASS
768.135135	142	36	Horz	1.51	21.93	23.44	40.53	46.00	-5.47	PASS
848.308426	136	357	Vert	1.48	23.07	24.55	34.22	46.00	-11.78	PASS

~~0.1.3~~8.1.6 Data over 1000 MHz

Frequency	Hgt	Ang	Pol	Peak	Peak Lmt	ΔL-Pk	Status
MHz	cm	deg		dBuV/m	dBuV/m	dB	
1035.000000	248	348	Horz	44.94	54.00	-9.06	PASS
1102.500000	152	144	Horz	45.15	54.00	-8.85	PASS
1203.750000	152	197	Horz	45.75	54.00	-8.25	PASS
1303.750000	152	358	Horz	44.88	54.00	-9.12	PASS
1603.750000	152	36	Horz	46.03	54.00	-7.97	PASS

Worst Mode: DV LOOP **Judgment**: Passed radiated test by FCC Class B by 5.47dB

All readings are quasi-peak under 1000 MHz and in average over 1000 MHz, unless stated otherwise.

Investigations of emissions up to 2 GHz were performed for this product.

TEST PERSONNEL:
Tester Signature: _____ Date: ___/___/
Typed/Printed Name: Vianney Saindon, EMI Specialist.

8.2 CE Data at 10m

Frequency	Hgt	Ang	Pol	Cab	Ant F	Tot C	QP	QP Lmt	ΔL-QP	Status
MHz	cm	deg		dB	dB/m	dB	dBuV/m	dBuV/m	dB	
33.389480	100	330	Vert	0.08	15.93	16.01	18.22	30.00	-11.78	PASS
114.552221	100	339	Vert	0.78	11.38	12.16	21.35	30.00	-8.65	PASS
118.136979	101	129	Vert	0.86	11.40	12.26	21.98	30.00	-8.02	PASS
196.623891	100	1	Vert	1.42	8.93	10.35	35.94	30.00	5.94	FAIL TV
768.126685	396	127	Horz	3.19	19.98	23.17	30.44	37.00	-6.56	PASS
848.297190	145	1	Vert	3.09	20.38	23.48	20.54	37.00	-16.46	PASS

~~0.1.1~~8.2.1 Measures extrapolated from 3m

Frequency	Hgt	Ang	Pol	Cab	Ant F	Tot C	QP	QP Lmt	ΔL-QP	Status
MHz	cm	deg		dB	dB/m	dB	dBuV/m	dBuV/m	dB	
196.622852	100	235	Vert	0.46	11.37	11.82	21.92	30.00	-8.08	PASS

Worst Mode: DV LOOP

Judgment: Passed radiated test by EN55022 Class B by 6.24dB

All readings are quasi-peak unless stated otherwise.

TEST PERSONNEL:
Tester Signature: _____ Date: ___/___/
Typed/Printed Name: Vianney Saindon, EMI Specialist.

9 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

where FS = Field Strength

RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5 dBμV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving field strength of 32 dBμV/m. The 32 dBμV/m value was mathematically converted to its corresponding level in μV/m.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBμV/m

Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

10 FCC Compliance Statement to appear in the manual

FCC Compliance Statement
Warning

Changes or modifications to this unit not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment.

The use of shielded cables for connection of the monitor to the card is required to meet FCC requirements.

Remark for RT2000/KIT/N

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna

Increase the separation between the equipment and receiver

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

Consult the dealer or an experienced radio/TV technician for help.

The user is advised that any equipment changes or modifications not expressly approved by the party responsible for compliance would void the compliance to FCC regulations and therefore, the user's authority to operate the equipment.

DECLARATION OF CONFORMITY
OF A CLASS B DIGITAL DEVICE
ACCORDING TO THE FCC RULES

We, the Responsible Party

Matrox
1075, Broken Sound Parkway
Boca Raton, FL 33487
Telephone : (561) 989-9626

Attention : Conformity Group Matrox
Declare that the Product

RT2000/KIT/N

Complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any question regarding this declaration should be forwarded to the above coordinates.

The above FCC Compliance Statement, which can have a different format, will be included in all production models of the RT2000/KIT/N user's manual

11 EN61000-3-3 Voltage Fluctuations

11.1 Test Description

The test standard EN61000-3-3 is applicable to Electrical and Electronic equipment having an input current up to and including 16A per phase and intended to be connected to public low voltage distributions systems. The standard was created to provide limits on the disturbing effect that equipment has on the AC supply.

. EN61000-3-3 defines limits on the level of voltage fluctuations produced by equipment per Generic Emission Standard EN500081-1: 1992.

~~0.2~~ 11.2 Test Configuration

The EUT was placed on a wooden table and was connected to AC Power Source 230V AC via the measuring equipment. The test setup and type of operation used during the test is the same as described in section 3 of this report. The worst case mode of operation was also used for these tests. Please refer to section 3 for more details. If needed, all other equipment or peripherals included in the test and having a separate power supply, are connected to the outlet, supplying 230VAC or 120VAC (50Hz/60Hz) depending of the actual peripheral. This ensures repeatability of the test. The EUT was powered by a 230 Vac, 50 Hz source.

~~0.3~~ 11.3 Test Procedure

The Test procedure was conform to the EN61000-3-3 Standard.

Please refer to section 3.2 for description of the EUT exercise Software executed during the tests.

~~0.4~~ 11.4 Test Limits

Table 3 EN61000-3-3 limits

	Limit
PST	1.00
DC(%)	3.00
DMAX(%)	4.00

11.5 Results

The power read was 130.83 Watts.The EUT passed the limits using the test procedure basing on the standard EN61000-3-3 (Data are shown in Appendix D)

12 EN61000-4-2 :1995 Electrostatic Discharge immunity

12.1 Test Description

The basic test standard EN61000-4-2: 1995, *Electromagnetic Compatibility part 4: Testing and Measurement Techniques, Section 2: Electrostatic Discharge Immunity test*, is the guiding document. The response of the sample is evaluated to Electrostatic Discharge events that occur to the body of the test sample up to +/-8kV if air discharges are used, +/-4kV in Direct Contact Discharge, +/- 4kV Indirect Horizontal Coupling.

~~0.2~~ 12.2 Test Configuration

The test configuration used for this test was similar to the one used for radiated emissions measurements, see section 3 of this report for more details. Section 7 of the EN61000-4-2: 1995 standard defines the test setup for table top devices. It consists of a 3 m by 2 m Ground plane (GP) electrically grounded, a non conductive table with a 1.6m by 0.8m Horizontal Coupling Plane (HCP). The HCP is grounded to the GP through two 470 kΩ resistors in series. The Electrostatic Discharge generator's gun is grounded via a round cable on the GP. The Electrostatic Discharge gun meets all specifications of EN61000-4-2: 1995.

~~0.3~~ 12.3 Test Procedure

The Static Electrical Discharges was applied only to those points and surfaces of the EUT which are expected to be touched during usual operation, including user access, as specified in the user manual.

The EUT was exposed to a total of 500 discharges, 125 each at negative and positive polarity at each level (2 kV and 4 kV), at five tests points (100 discharges at each point). One of the test points was subjected to 50 indirect discharges in each polarity (contact) to the center of the front edge of the horizontal-coupling plane. The remaining four test points had each received 100 direct contact discharges.

If a discharge occurs and an error is caused, the type of error, discharge level and location of the discharge is recorded. The EUT shall meet at least criteria B, knowing the criteria A is the goal. (See Section 12.4).

~~0.4~~ 12.4 Test Limits Performance Criteria

A- The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when equipment is used as intended.

B- After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed. After the application of the phenomena below a performance specified by the manufacturer.

C- Temporary loss of function is allowed. Operation of the EUT may stop as long as it is either automatically reset or can be manually restored by operation of the controls.

The intended utilization of the EUT is to display some graphic patterns on the screen of the monitor. A loss of performance could be seen on the screen as flickering or distortion of the pattern.

~~0.5~~ 12.5 Tests Points

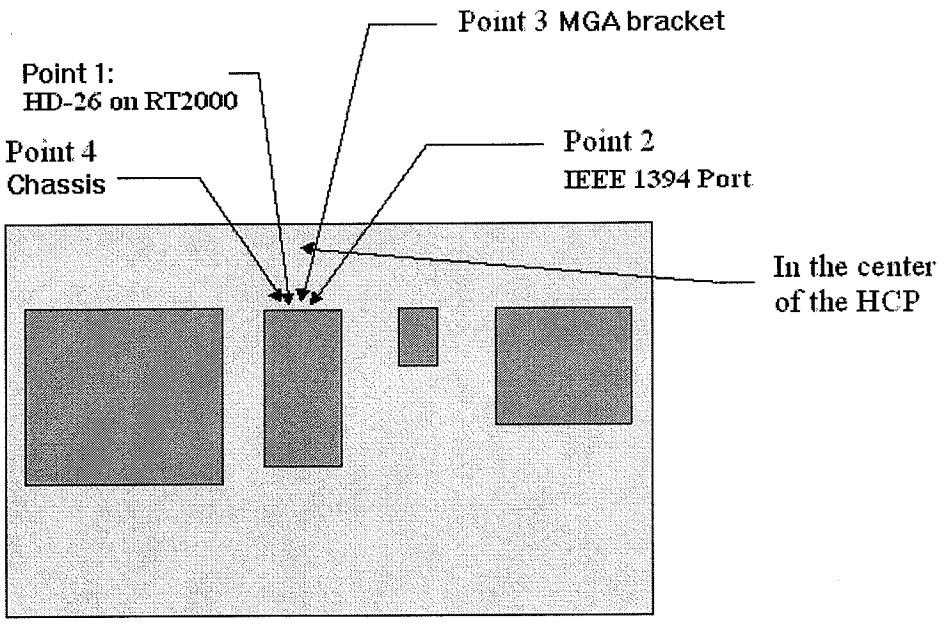


Figure 11.1 ESD Test points

~~0.6~~ 12.6 Results

The EUT met the criteria A at a level of +/- 4kV Contact Discharge using the test procedure described in EN55024(1998) and basing on the standard EN61000-4-2 (1995)
(Data are shown in Appendix A).

13 EN61000-4-3 Radiated RF Electromagnetic field Immunity test

13.1 Test Description

The basic test standard EN61000-4-3:1995 : *Electromagnetic Compatibility Standard, Radiated Electromagnetic Field Immunity Test*, was the guiding document for this test. This test evaluates the response of the sample to a incoming radiated electric field. It was performed from 80 to 1000 MHz at a level of 6 V/m, 80 % modulated with 1kHz sine wave.

~~0.2~~ 13.2 Test Configuration

The test configuration used for this test was similar to the one used for radiated emissions measurements, see section 3 of this report for more details. In addition, Section 7 of EN61000-4-3 is also used to specify the test setup. Appendix B of this report (EN61000-4-3 Radiated Electromagnetic Field Immunity Test Setup) shows the actual test setup used during this test.

~~0.3~~ 13.3 Test Procedure

The EUT is set into operation and was monitored for variations in performance. The test signals start frequency (80 MHz) and stop frequency (1000MHz) were set. The field at 6 V/m is 80% modulated. The test software maintains the necessary field strength through the frequency range. The applied stess is a result of a Field Uniformity Test performed in the semi-anechoic room at least every 6 months. During the test the EUT performance is investigated by using a video camera.

In our case, where the most sensitive surface of the EUT is known to be the back, testing was restricted only to that surface.

Table 4 EN61000-4-3 RF Stress details

Start Frequency	80.000MHz
Stop Frequency	1.000GHz
Sweep Scale	Log
Frequency Increment	4%
Sensor Level	6.00V/m
Leveling window	10%
Dwell Time	2.90 s
Modulation	80%
Generator Max. Level	0.00dBm

Please refer to Appendix B for more details on the test set-up.

13.4 Test Limits Performance Criteria

Please refer to section 11.4 for more information about Immunity test criteria.

13.5 Results

The EUT met the criteria A at a level of 6 V/m, 80% modulated with 1KHz sine wave, using the test procedure described in EN55024(1998) and basing on the standard EN61000-4-3 (1995).

(Data are shown in Appendix B)

14 ENV50204 Radiated Electromagnetic field from digital radio telephones - Immunity test

14.1 Test Description

The basic test standard ENV50204:1996 : *Radiated Electromagnetic field from digital radio telephones - Immunity test*, was the guiding document for this test. This test evaluates the response of the sample to an incoming pulsed radiated electric field. It was performed at 900 MHz at a level of 6 V/m, 100 % AM modulated with 200 Hz square wave.

~~0.2~~ 14.2 Test Configuration

The test configuration used for this test was similar to the one used for radiated emissions measurements, see section 3 of this report for more details. In addition, Section 7 of EN61000-4-3 is also used to specify the test setup. Appendix B of this report (EN61000-4-3 Radiated Electromagnetic Field Immunity Test Setup) shows the actual test setup used during this test.

~~0.3~~ 14.3 Test Procedure

The EUT is set into operation and was monitored for variations in performance. The test signals frequency (900 MHz) was set. The field at 6 V/m is 100% AM modulated. The test software maintains the necessary field strength through the frequency range. The applied stress is a result of a Field Uniformity Test performed in the semi-anechoic room at least every 6 months. During the test the EUT performance is investigated by using a video camera.

In our case where the most sensitive surface side of the EUT is known to be the back, testing was then restricted that surface to side only.

Table 5 ENV50204 RF Stress details

Frequency	900 MHz
Sensor Level	6.00V/m
Leveling window	10%
Dwell Time	60 s
Modulation AM, 200 Hz	100 %
Generator Max. Level	0.00dBm

Please refer to Appendix B for more details on the test set-up.

~~0.5~~ 14.4 Test Limits Performance Criteria

Please refer to section 11.4 for more information about Immunity test criteria.

~~0.6~~ 14.5 Results

The EUT met the criteria A at a level of 6 V/m, 100% AM modulated with 200 Hz sqare wave, using the test procedure described in standard ENV50204 (1996).

15 EN61000-4-4 Electrical Fast Transient Burst Immunity

15.1 Test Description

The basic test standard EN61000-4-4 : 1995 ; *Electromagnetic Compatibility part 4: Testing and Measurement techniques, Section: 4 Electrical Fast transient/Burst Immunity Test* was guiding document. This test evaluates the test sample's response to Electrical fast transients conducted on A.C supply, and all I/O lines.

A test signal of +/-1kV was Coupled AC Line and Ground, Neutral and Ground, AC Line plus Neutral and Ground and protective Earth and Ground. Test signal of +/-0.5kV is to be coupled to all I/O lines exceeding 3m through the use of a capacitive clamp when relevant.

~~0.2~~ 15.2 Test Configuration

The test configuration used for this test was similar to the one used for radiated emissions measurements, see section 3 of this report for more details. In addition, Section 7 of EN61000-4-4 is also used to specify the test setup.

~~0.3~~ 15.3 Test Procedure

The EUT was connected to the test equipment, and monitored for performance. The test level was adjusted to 1kV and applied for 60 seconds duration. A test signal of +/-1kV was Coupled to Line and Ground, Neutral and Ground, Line plus Neutral and Ground and protective Earth and Ground. If an error occurs, the test level and the conditions is to be noted.

~~0.4~~ 15.4 Test Limits Performance Criteria

The EUT shall meet at least criteria B, knowing the criteria A is the goal. (See Section 11.4 for definition of Passing Criteria)

~~0.5~~ 15.5 Results

The EUT met the criteria A at a level of +/- 1kV during 60 seconds, using the test procedure described in EN55024 (1998) and the basic standard EN61000-4-4 (1995).
(Data are shown in Appendix C).

16 EN61000-4-5 Surge immunity test

16.1 Test Description

The basic test standard EN61000-4-5:1995 ; *Electromagnetic Compatibility part 4: Testing and Measurement techniques, Section:5 Surge Immunity* test was the guiding document. This test evaluates the test samples's response to a surge voltage applied on AC supply port of an EUT.

A test signal of +/-2kV was coupled between AC Line to Ground, AC Neutral to Ground. And a test signal of +/-1kV was coupled between AC Line to AC Neutral.

~~0.2~~ 16.2 Test Configuration

The test configuration used for this test was similar to the one used for radiated emissions measurements, see section 3 of this report for more details. In addition, Section 7 of EN61000-4-5 is also used to specify the test setup.

~~0.3~~ 16.3 Test Procedure

The EUT was connected to the test equipment, and monitored for performance. A test signal of +/-2kV was repeated for 5 times every 60 seconds, it was coupled between AC Line to Ground and AC Neutral to Ground. A test signal of +/-1kV was repeated for 5 times every 60 seconds, it was coupled between AC Line to AC Neutral. If an error occurs, the test level and the conditions is to be noted.

~~0.4~~ 16.4 Test Limits Performance Criteria

The EUT Shall meet at least criteria B, knowing the criteria A is the goal (See Section 12.4).

~~0.5~~ 16.5 Results

The EUT met the criteria B for all coupling modes, the test procedure is described in EN55024(1998) and the basic standard EN61000-4-5 (1995).

(Data are shown in Appendix E)

17 EN61000-4-6 Immunity to conducted disturbances

17.1 Test Description

The basic test standard EN61000-4-6:1994 : ; *Electromagnetic Compatibility part 4: Testing and Measurement techniques, Section 6: Immunity to conducted disturbances, induced by radio frequency fields*, was the guiding document for this test. This test evaluates the response of the sample to an incoming conducted RF signal. It was performed from 150 kHz to 80 MHz at a e.m.f. voltage level of 3 V, 80 % modulated with 1kHz sine wave.

~~0.2~~ 17.2 Test Configuration

The test configuration used complies with section 7 of EN61000-4-6. Appendix F of this report (EN61000-4-6 Conducted Disturbances Immunity Test Setup) shows the actual test setup used during this test.

~~0.3~~ 17.3 Test Procedure

The EUT is set into operation and was monitored for variations in performance. The test signals start frequency (150 kHz) and stop frequency (80MHz) were set. The e.m.f voltage level of 3V is 80% modulated. The test software maintains the necessary field strength through the frequency range. The applied stress is a result of a Calibration Test performed before testing the EUT.

Table 6 EN61000-4-6 RF Stress details

Start Frequency	150.000kHz
Stop Frequency	80.000MHz
Sweep Scale	Log
Frequency Increment	1%
Sensor Level	130.00dBµV
Levelling window	10%
Dwell Time	2.80 s
Modulation	80%
Generator Max. Level	0.00 dBm

Please refer to Appendix F for more details on the test set-up.

~~0.4~~ 17.4 Test Limits Performance Criteria

Please refer to section 11.4 for more information about Immunity test criteria.

~~0.5~~ 17.5 Results

The EUT met the criteria A at a e.m.f voltage level of 3 V, 80% modulated with 1KHz sine wave, using the test procedure described in EN55024(1998) and basing on the standard EN61000-4-6 (1994).

(Data are shown in Appendix F)

18 EN61000-4-11 Voltage dips, short interruptions and voltage variations immunity tests

18.1 Test Description

The basic Standard EN61000-4-11:1995 ; *Electromagnetic Compatibility part 4: Testing and Measurement techniques, Section:11 Voltage dips, short interruptions and voltage variations immunity tests* was the guiding document. This test evaluates the test samples's response to voltage dips, short interruptions and voltage variations. The test consists of three parts:

Part 1:Voltage dips <5% from the nominal voltage were applied for 10ms for three times spaced 15 seconds.

Part 2:Voltage dips 70% from the nominal voltage were applied for 500ms for three times spaced 15 seconds.

Part 3 :Voltage dips <5% from the nominal voltage were applied for 5000ms for three times spaced 240 seconds.

~~0.2~~ 18.2 Test Configuration

The test configuration used for this test was similar to the one used for radiated emissions measurements, see section 3 of this report for more details. In addition, Section 7 of EN61000-4-11 is also used to specify the test setup.

~~0.3~~ 18.3 Test Procedure

The EUT was connected to the test equipment, and monitored for performance.

Part 1:Voltage dips <5% from the nominal voltage were applied for 10ms for three times spaced 15 seconds.

Part 2:Voltage dips 70% from the nominal voltage were applied for 500ms for three times spaced 15 seconds.

Part 3 :Voltage dips <5% from the nominal voltage were applied for 5000ms for three times spaced 240 seconds.

If an error occurs, the test level and the conditions is to be noted.

~~0.4~~ 18.4 Test Limits Performance Criteria

The EUT Shall meet at least criteria B for part 1, at least criteria C for part 2 and C for part 3 (See Section 12.4).

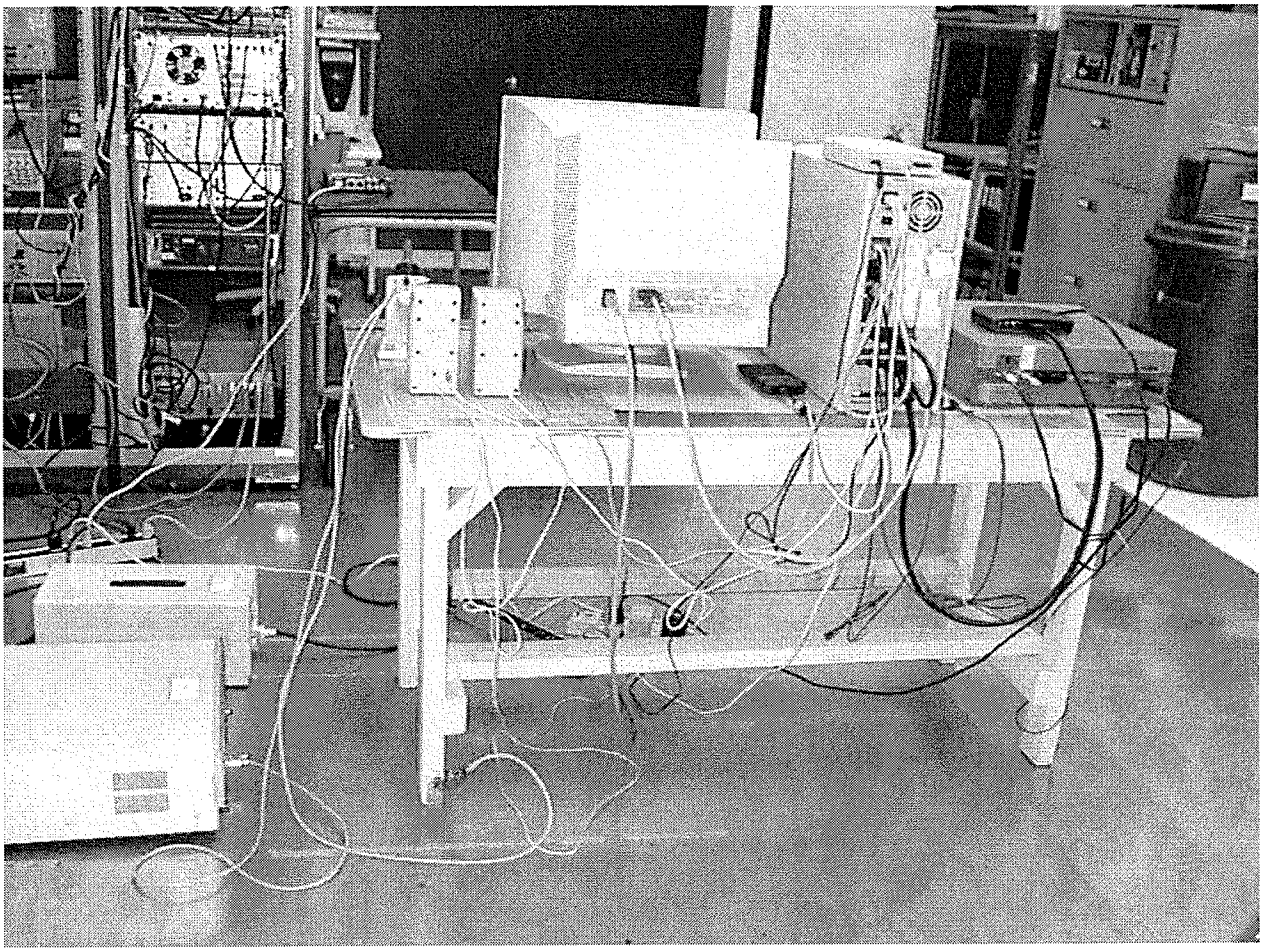
~~0.5~~ 18.5 Results

The EUT met criteria A for part 1, criteria A for part 2 and criteria C for part 3 using the test procedure described in EN55024(1998) and the basic standard EN61000-4-11 (1995).

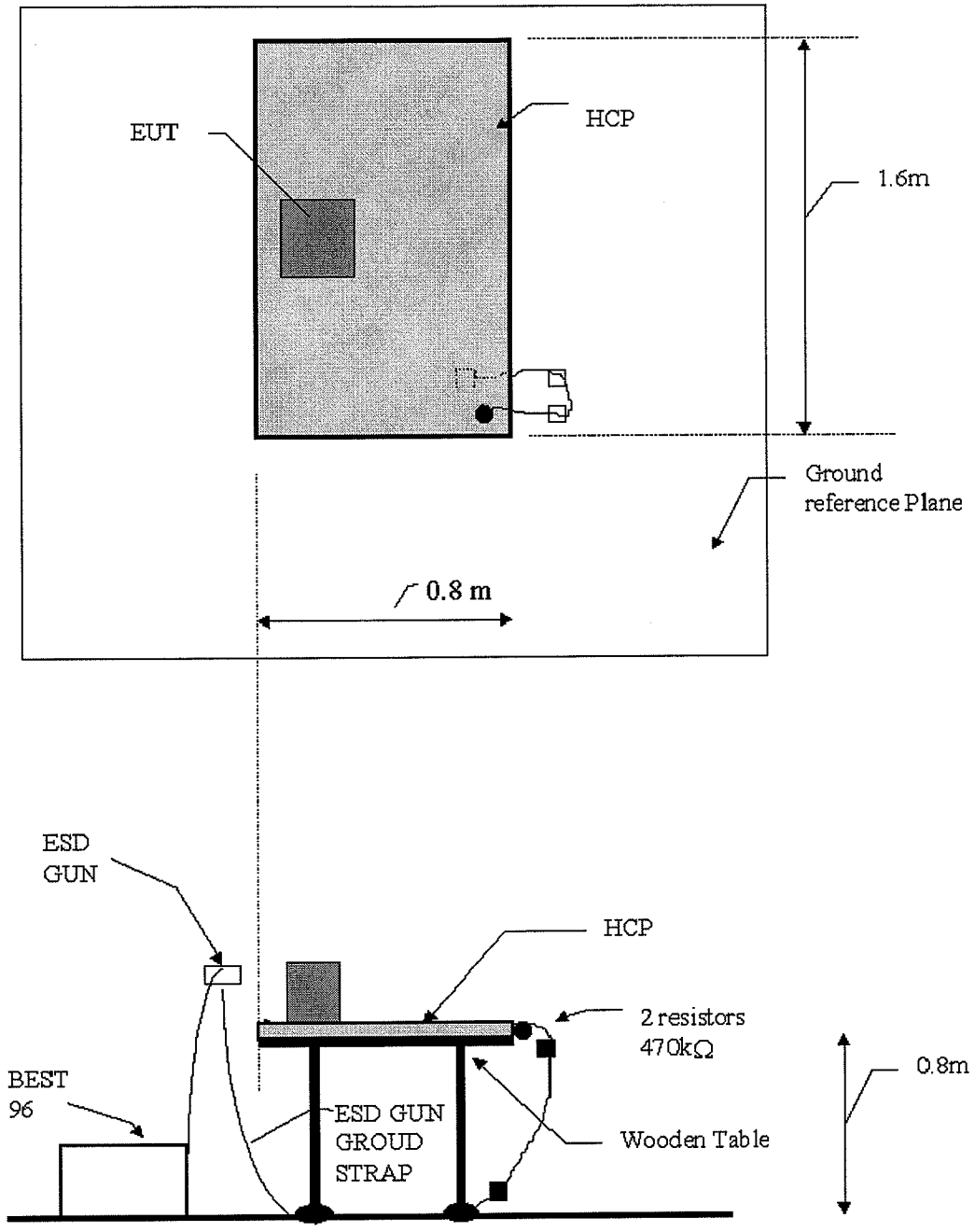
(Data are shown in Appendix G)

19 Appendix A: EN61000-4-2 Electrostatic Discharge Immunity

19.1 Test Configuration Photographs



19.2 Test Setup



19.3 EN61000-4-2 Test Results

ESD Worksheet

Date : (aa / mm / jj)

Completed by : Vianney Saindon

Equipment to test : RT2000/KIT/N

Standard : ☒ **EN61000-4-2:1995** ☒ **EN55024 :1998**

Other : N/A

EUT Number :367 Temp :22°C Humid :42 % (if air discharges are used)

HPC in center front

Number of discharges	25	25	25	25
Contact discharges	+2kV	-2kV	+4kV	-4kV

Behavior : ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Point 1 HD-26 on RT2000

Air Discharges	----------	----------	----------	----------
Number of discharges	25	25	25	25
Contact discharges	+2kV	-2kV	+4kV	-4kV

Behavior : ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Point 2 IEEE 1394 Port

Air Discharges	----------	----------	----------	----------
Number of discharges	25	25	25	25
Contact discharges	+2kV	-2kV	+4kV	-4kV

Behavior : ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Point 3 MGA Bracket

Air Discharges	----------	----------	----------	----------
Number of discharges	25	25	25	25
Contact discharges	+2kV	-2kV	+4kV	-4kV

Behavior : ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Point 4 Chassis

Air Discharges	----------	----------	----------	----------
Number of discharges	25	25	25	25
Contact discharges	+2kV	-2kV	+4kV	-4kV

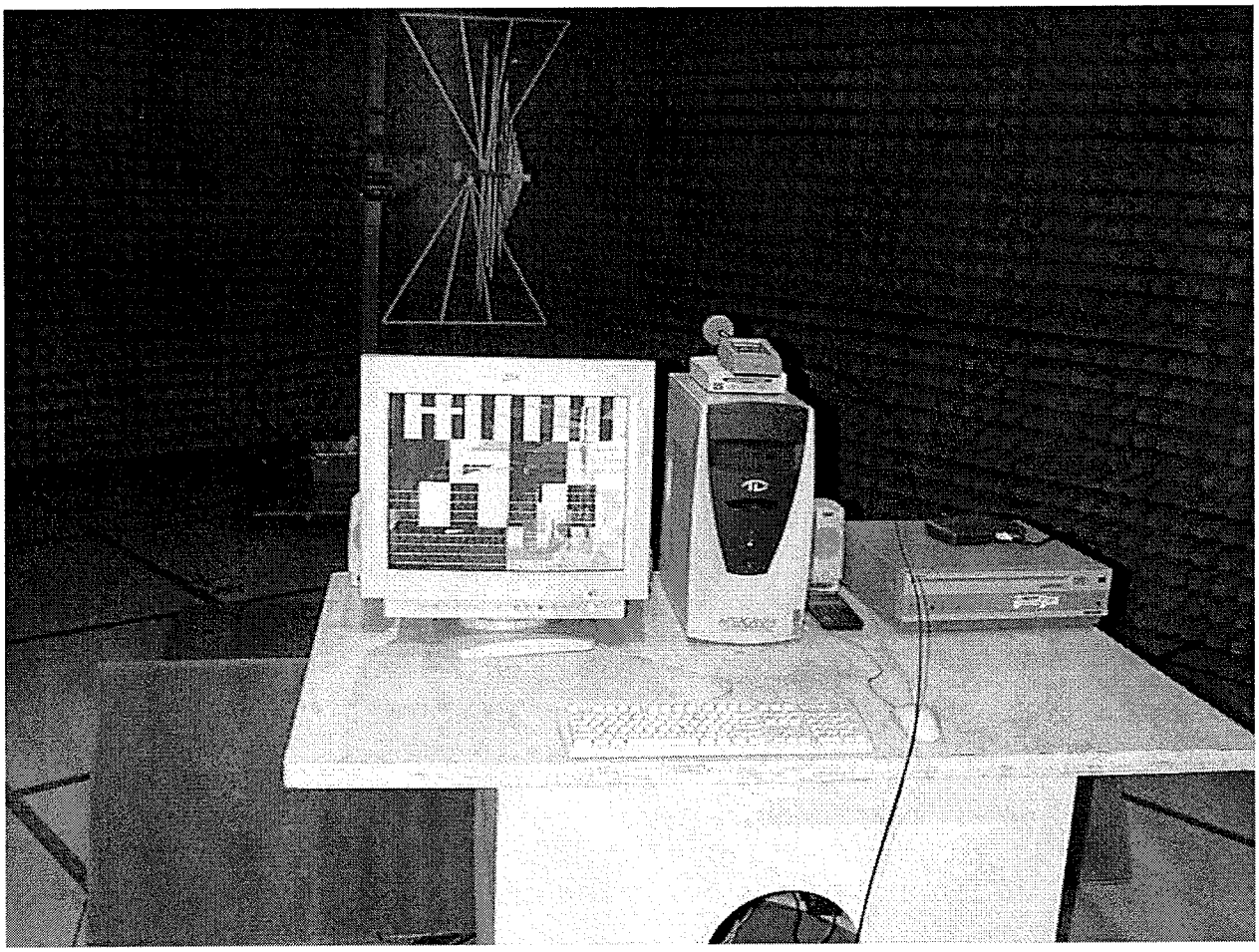
Behavior : ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Conclusion:
The EUT met criteria 1.

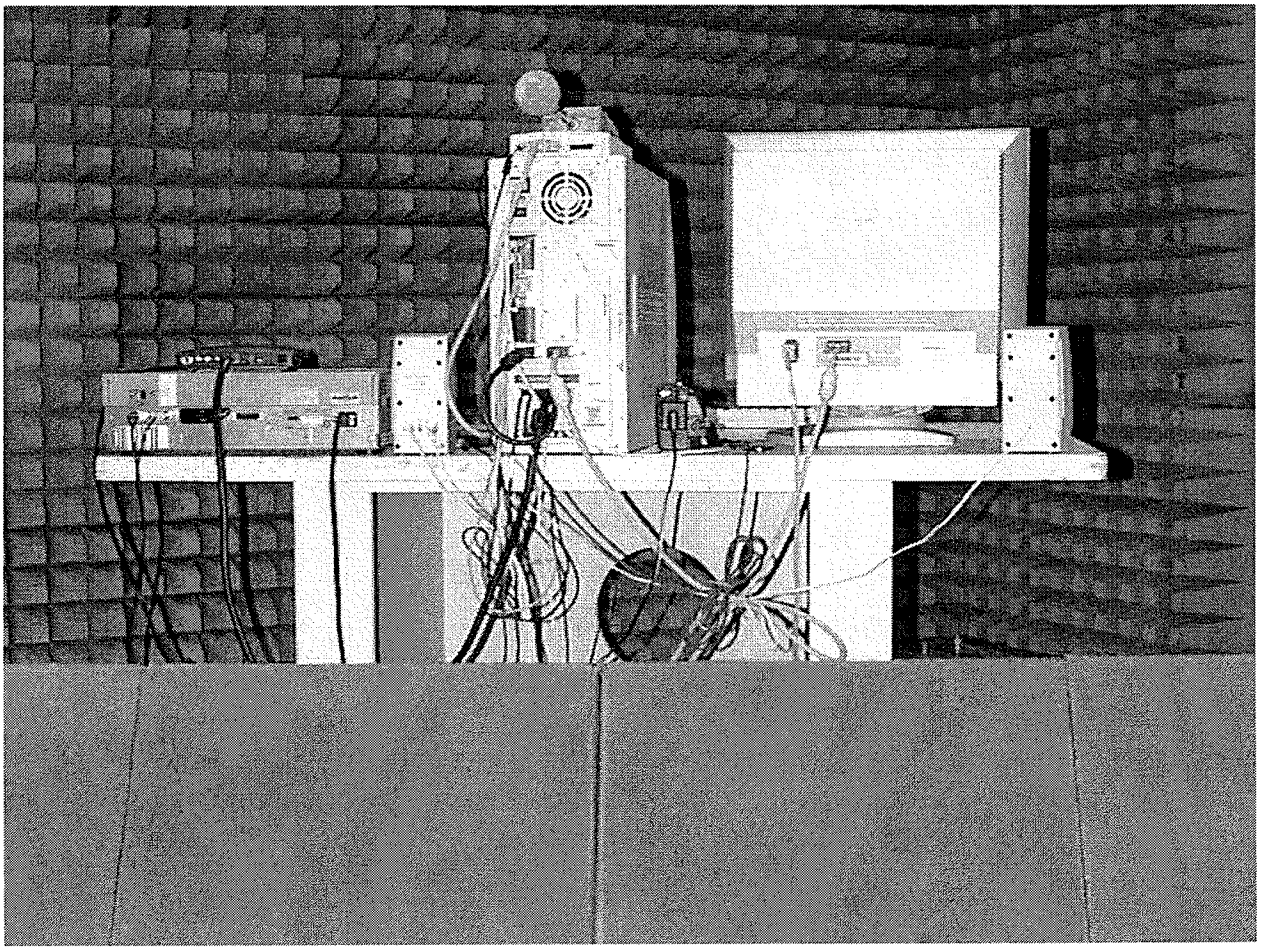
20 Appendix B: EN61000-4-3 Radiated RF-Electromagnetic Field

20.1 Test Configuration Photographs

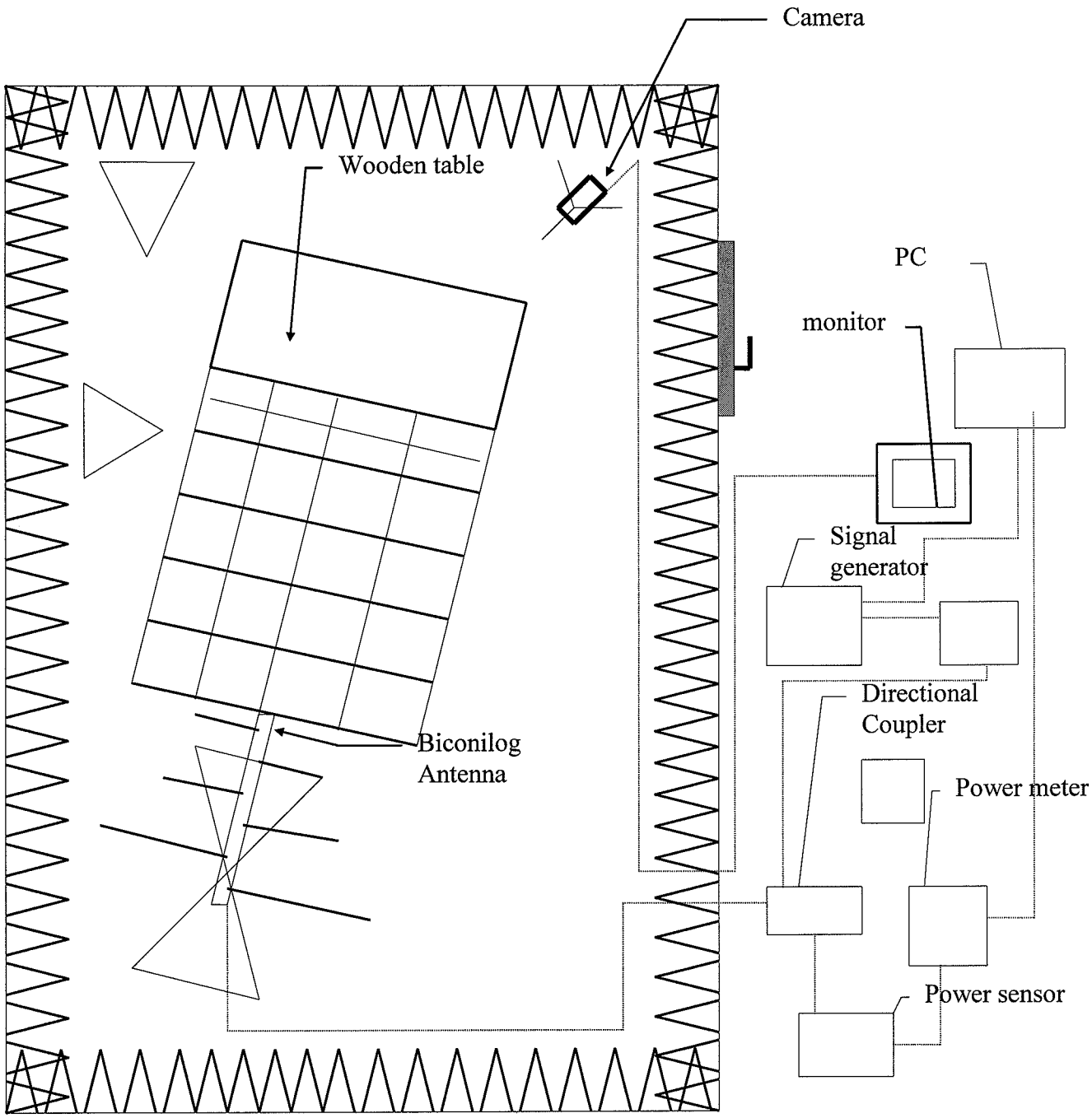
20.1.1 Front



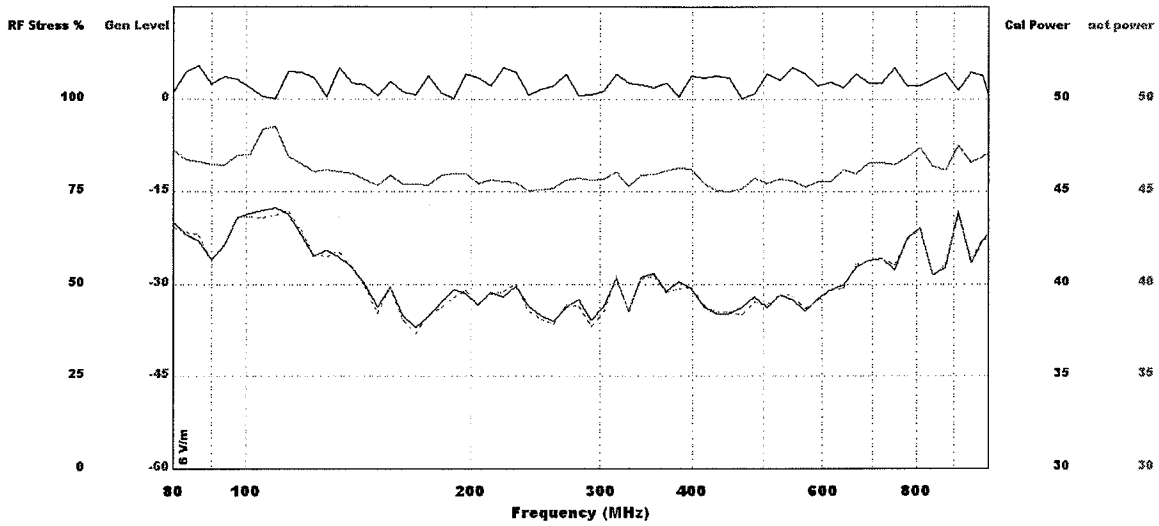
20.1.2 Rear



20.2 Test Setup

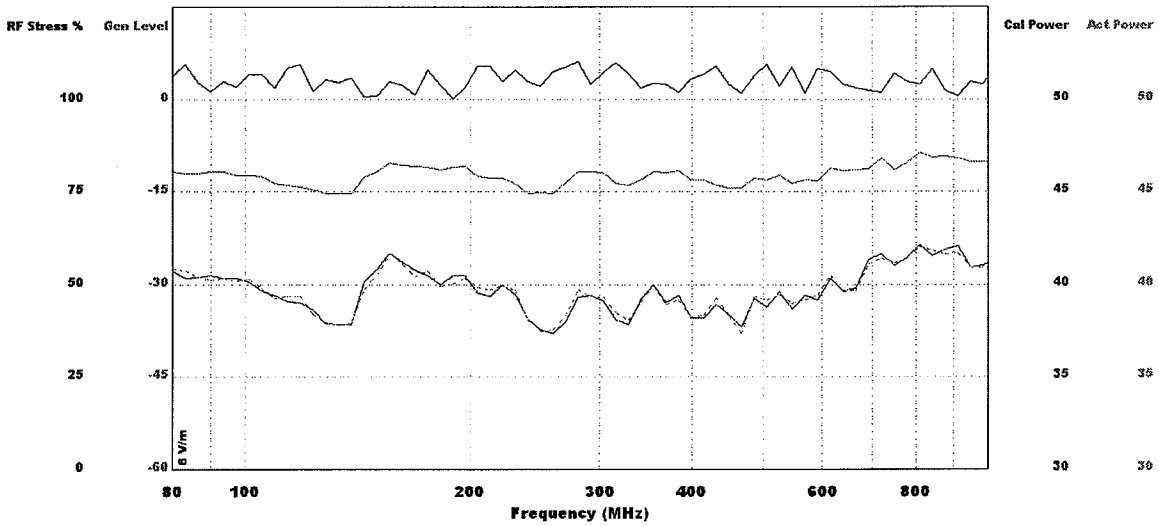


20.2.1 Vertical RF stress applied



No Error was observed during the test.

20.2.2 Horizontal RF stress applied

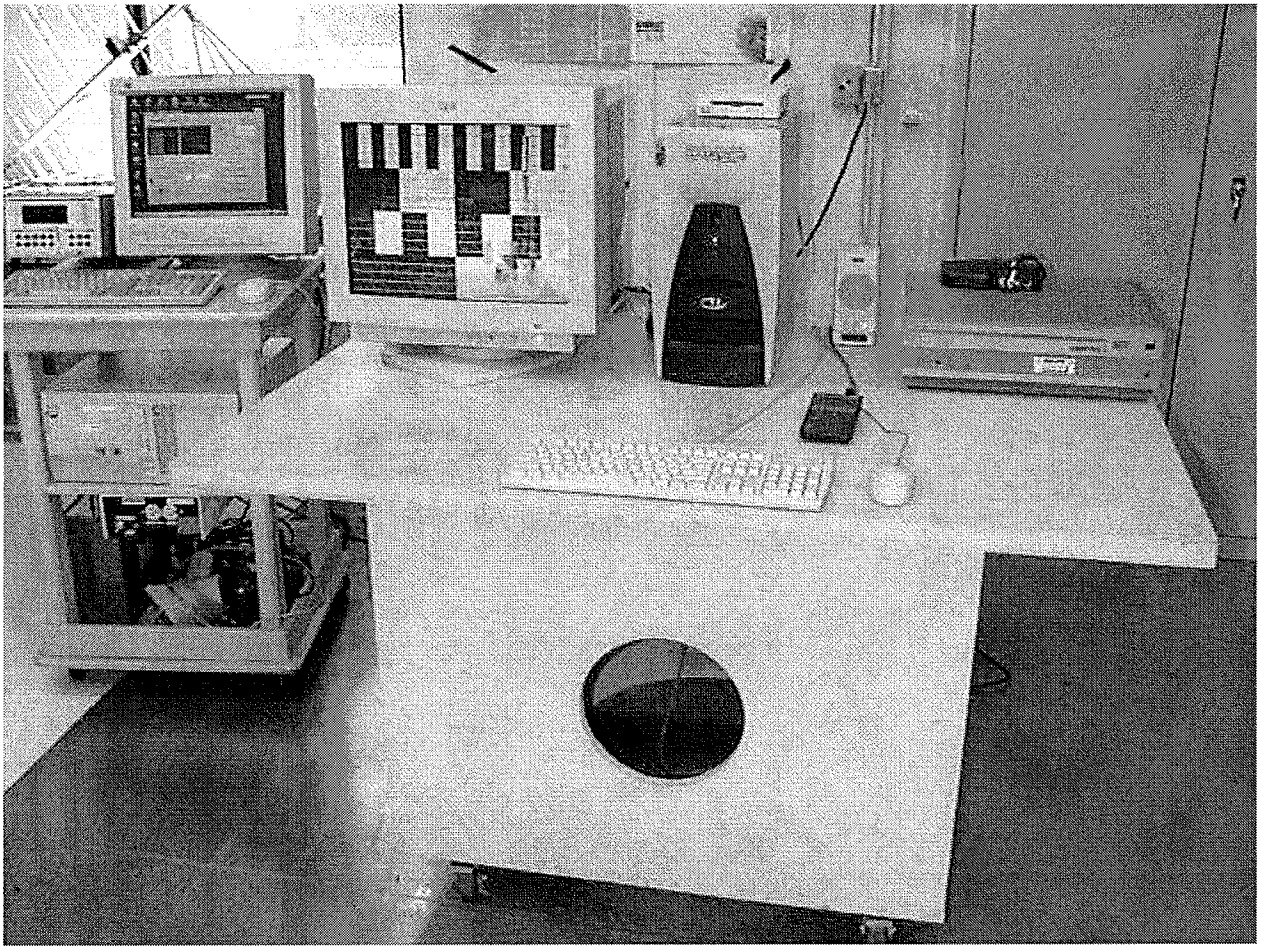


No Error was observed during the test.

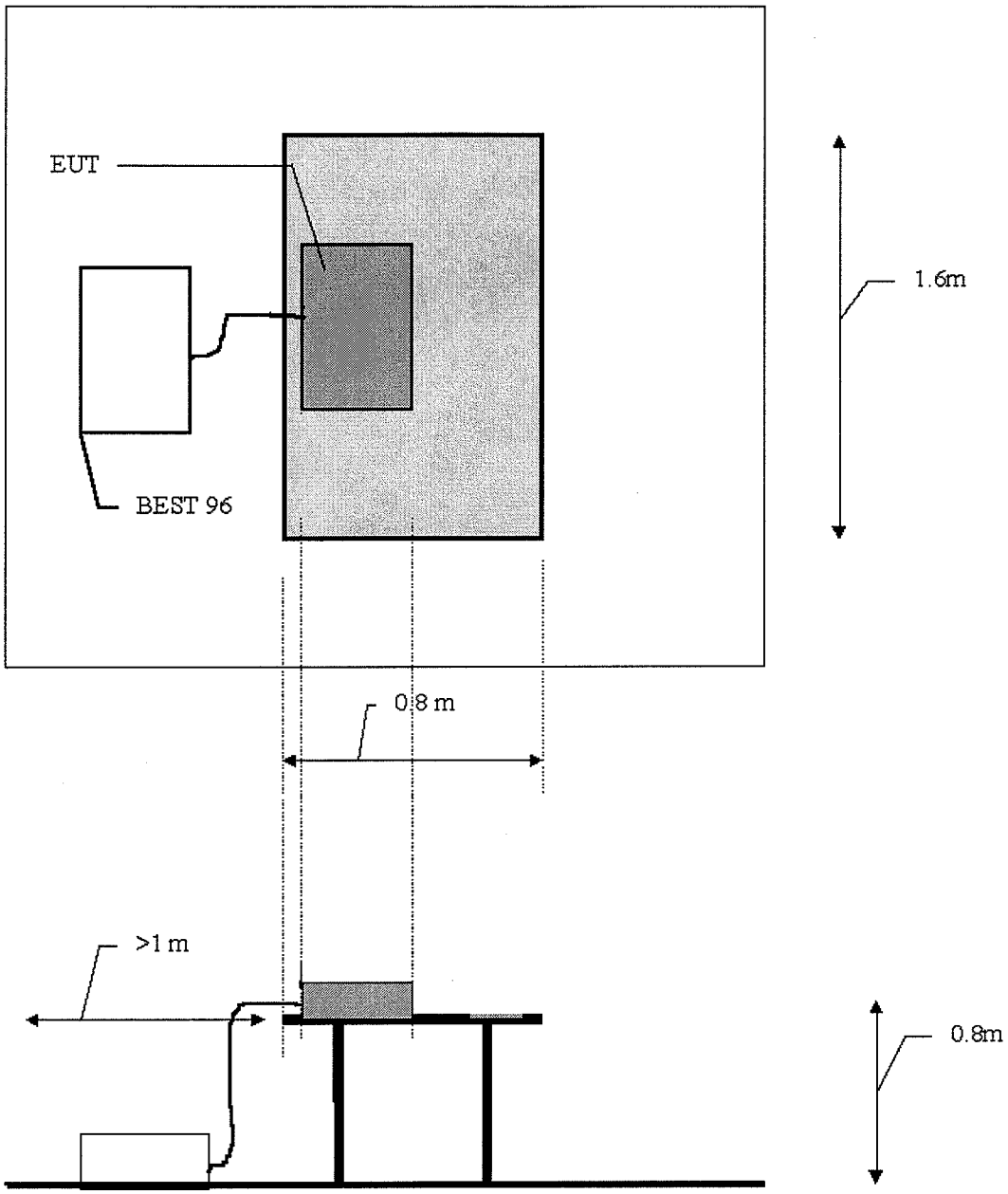
21 Appendix C: EN61000-4-4 Electrical Fast Transient/Burst Immunity

21.1 Test Configuration Photographs

21.1.1 AC Power Line



21.2 Test Setup



21.3 EN61000-4-4 Test Results

EFT Worksheet

Date :
(aa / mm / jj)

Completed by : Vianney Saindon

Equipment to test : RT2000/KIT/N

Standard : ☒ EN61000-4-4:1995
☒ EN55024 :1998
Other : N/A

EUT Number :367

Temp :22°C **Humid :** 42 % (if capacitive clamp)
Barometric pressure : 100.92 kPa

Location : ☒ AC line ☒ Host ☐ EUT
☐ Data line #1 Port :
☐ Data line #2 Port :
☐ Data line #3 Port :
☐ Date line #4 Port :

Ajouter des feuilles au besoin

AC LINE (Direct coupling)

Voltage	Elapse time				
1 kV	60 seconds	L/EARTH	DONE	+ ☒	- ☒
1 kV	60 seconds	N/EARTH	DONE	+ ☒	- ☒
1 kV	60 seconds	L+N/EARTH	DONE	+ ☒	- ☒
1 kV	60 seconds	PE/EARTH	DONE	+ ☒	- ☒

Behavior: ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Data line #1 (capacitive clamp) N/A

Voltage	Elapse time			
500 V	60 seconds	DONE	+ ☐	- ☐

Behavior: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Data line #1 (capacitive clamp) N/A

Voltage	Elapse time			
500 V	60 seconds	DONE	+ ☐	- ☐

Behavior: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Data line #1 (capacitive clamp) N/A

Voltage	Elapse time			
500 V	60 seconds	DONE	+ ☐	- ☐

Behavior: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

Data line #1 (capacitive clamp) N/A

Voltage	Elapse time			
500 V	60 seconds	DONE	+ ☐	- ☐

Behavior: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ Notes below

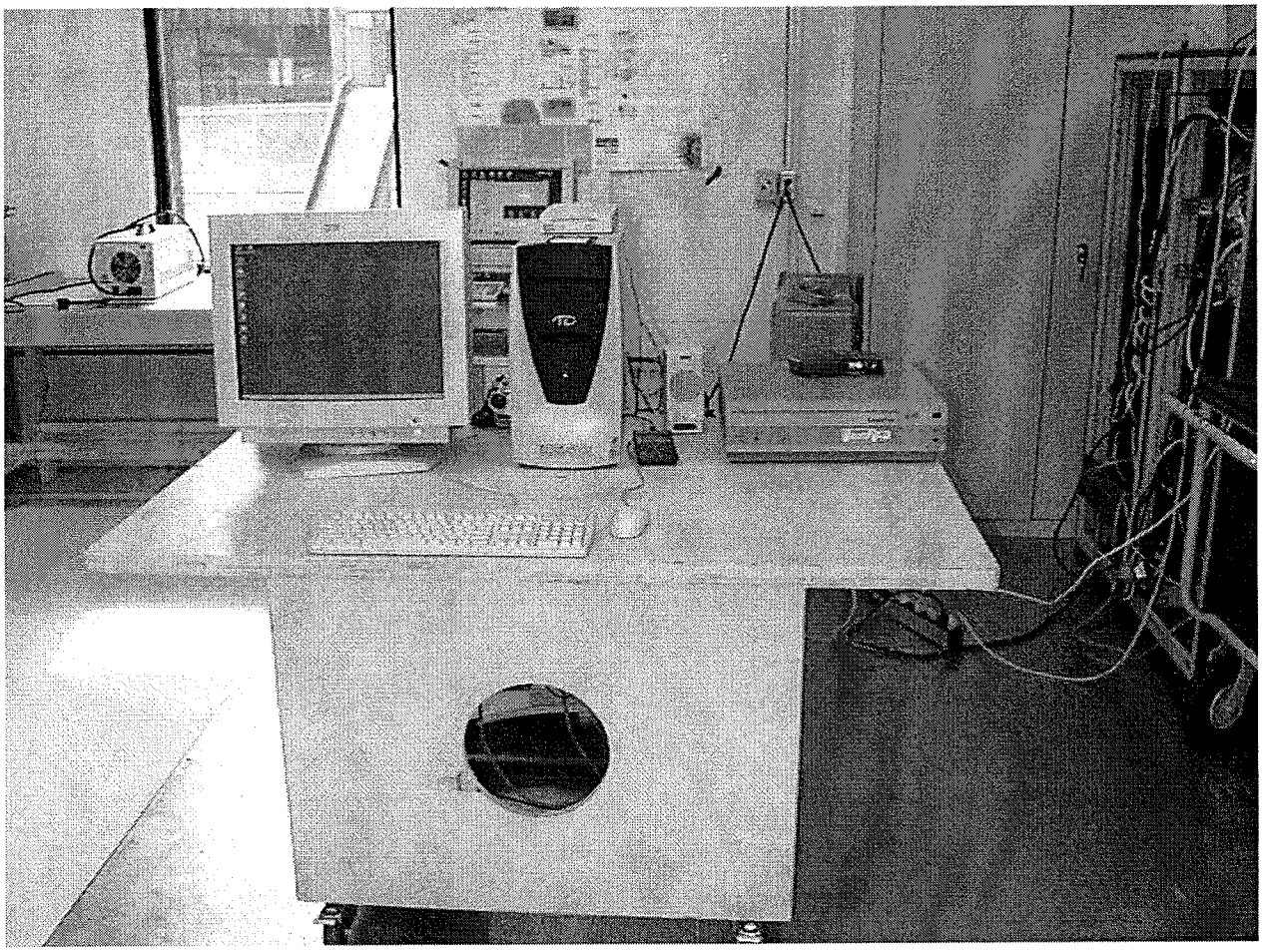
Conclusion:

The EUT met criteria 1.

22 Appendix D: Voltage Fluctuations EN61000-3-3

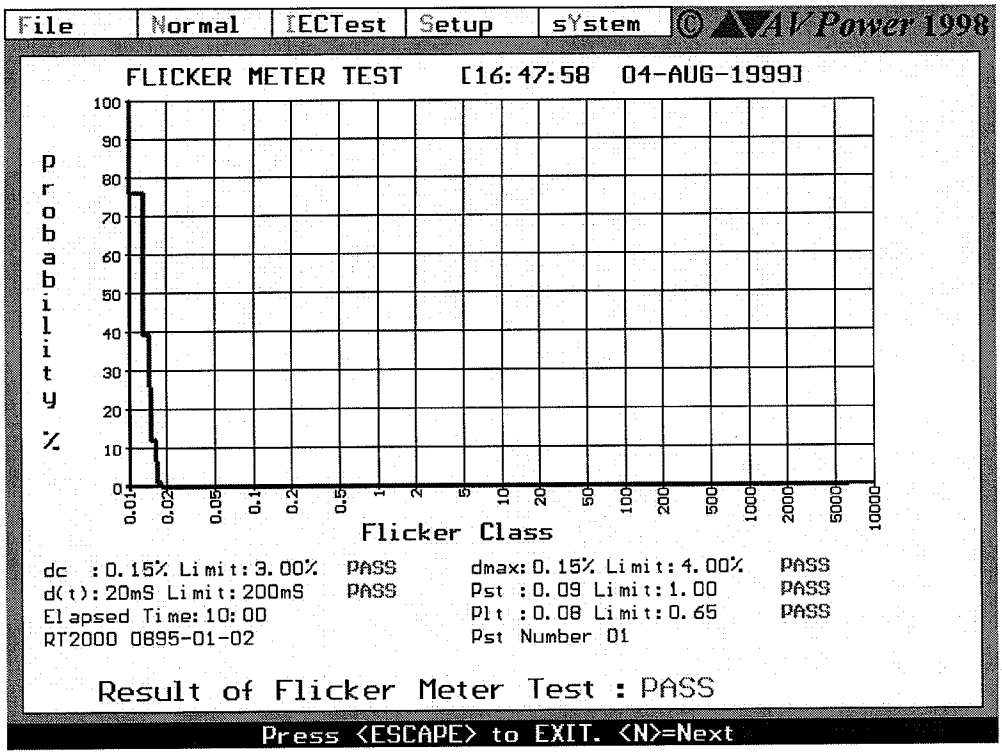
22.1 Test Configuration Photographs

22.1.1 Flicker

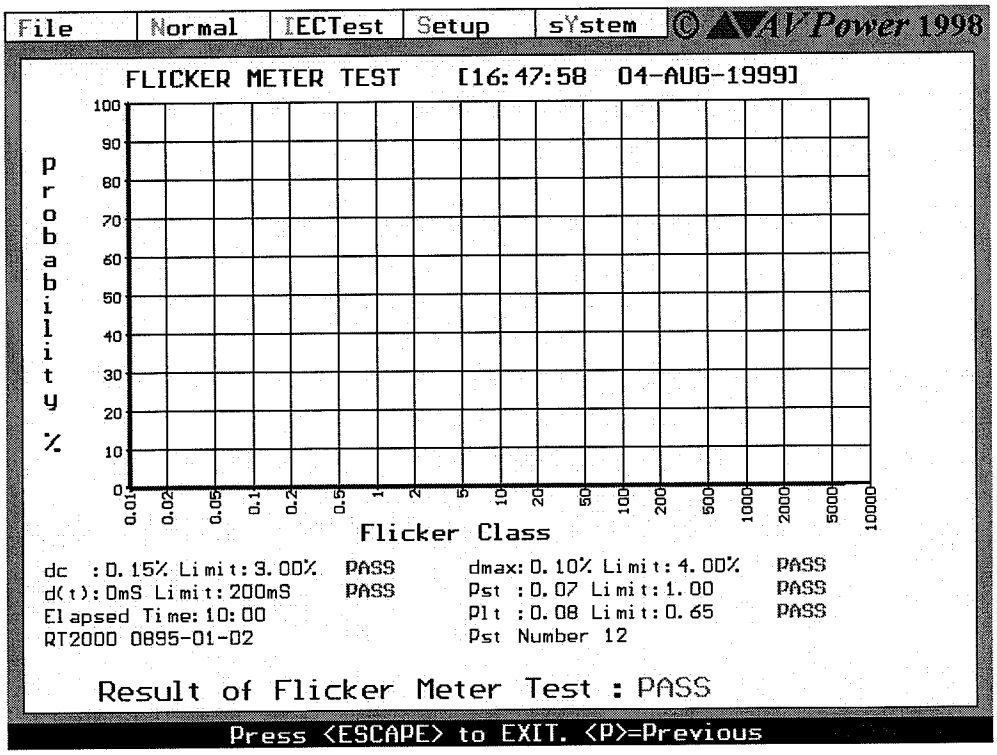


22.2 EN61000-3-3 Flicker Test Results

22.2.1 PST 01

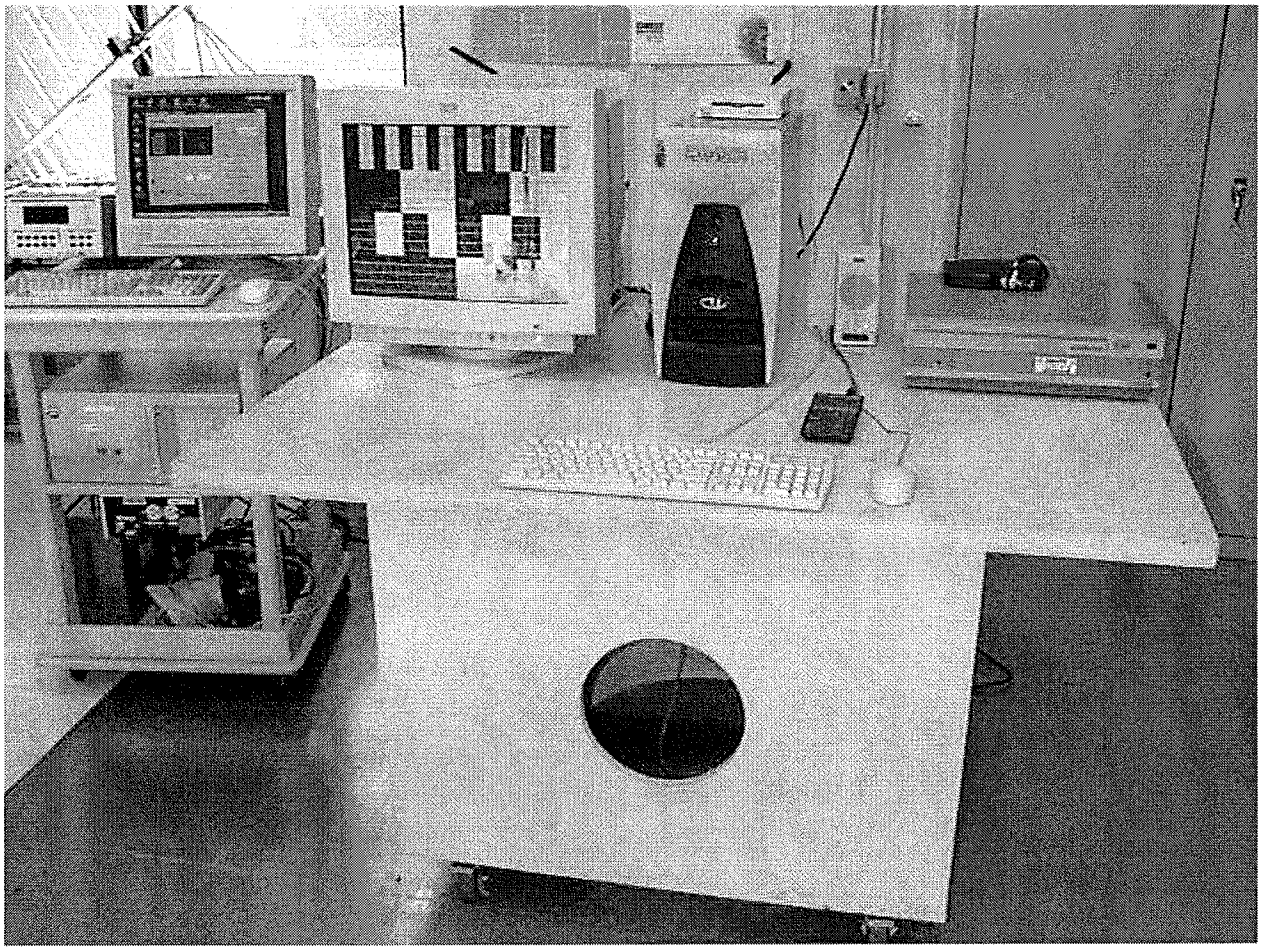


22.2.2 PST 12

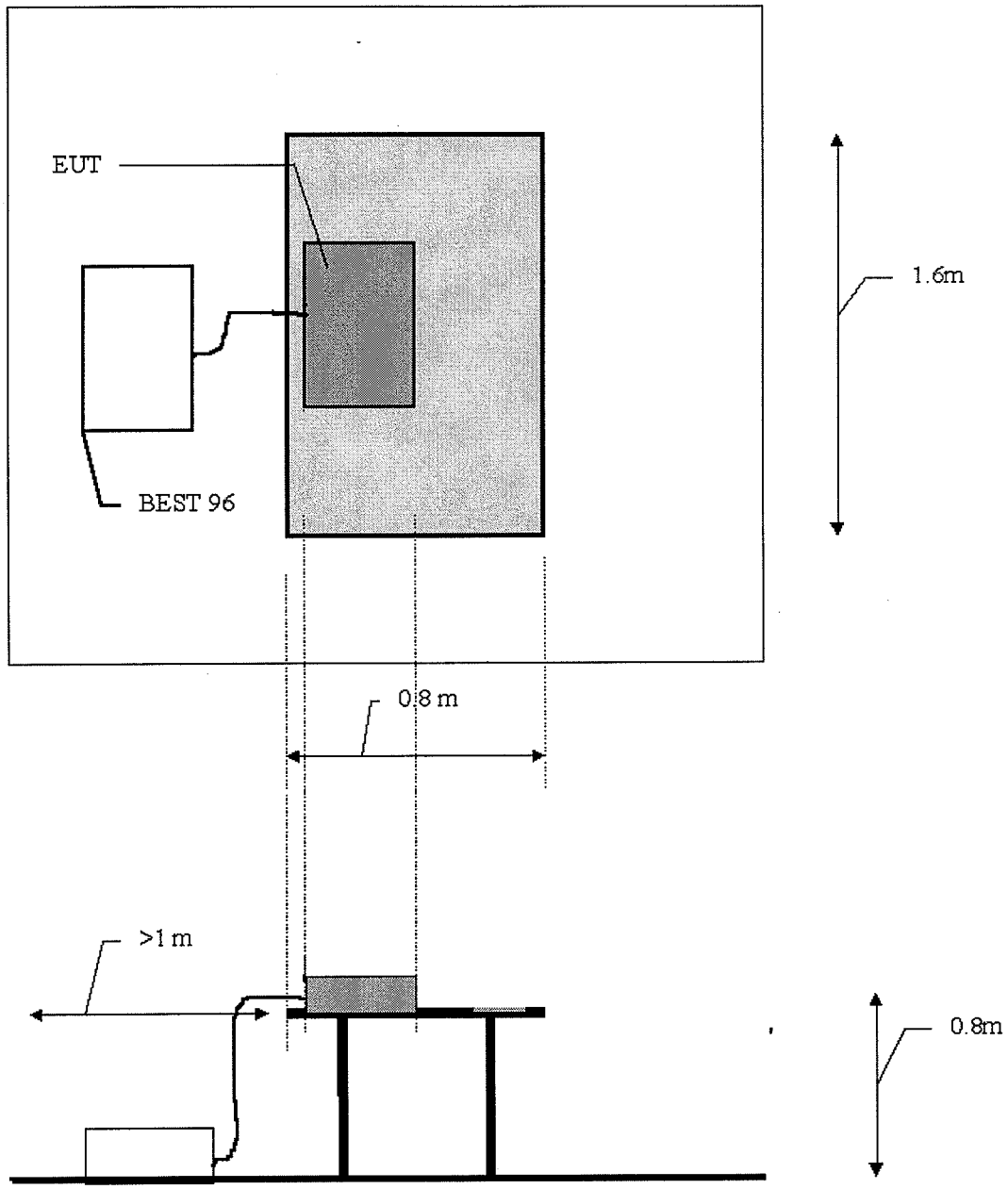


23 Appendix E: EN61000-4-5 Surge immunity test

23.1 Test Configuration Photographs



23.2 Test Setup



23.3 EN61000-4-5 Test Results

SURGE Worksheet

Date :
(aa / mm / jj)

Completed by : Vianney Saindon

Equipment to test : RT2000/KIT/N

Standard : ☒ **EN61000-4-5:1995**
☒ **EN55024 :1998**
Other : N/A

EUT Number :367 **Temp :22°C** **Humid : 42 %**
Barometric pressure : 100.92 kPa

AC Line

Coupling	Voltage	Repetitive Rate	Number	Result
L/EARTH	☒ +2 kV ☐ Other + ___ kV	☒ 60 s ☐ Other ___ s	☒ 5 ☐ Other ___	B
L/EARTH	☒ - 2 kV ☐ Other + ___ kV	☒ 60 s ☐ Other ___ s	☒ 5 ☐ Other ___	B
N/EARTH	☒ +2 kV ☐ Other + ___ kV	☒ 60 s ☐ Other ___ s	☒ 5 ☐ Other ___	A
N/EARTH	☒ - 2 kV ☐ Other + ___ kV	☒ 60 s ☐ Other ___ s	☒ 5 ☐ Other ___	A
L/N	☒ +1 kV ☐ Other + ___ kV	☒ 60 s ☐ Other ___ s	☒ 5 ☐ Other ___	A
L/N	☒ - 1 kV ☐ Other + ___ kV	☒ 60 s ☐ Other ___ s	☒ 5 ☐ Other ___	A

Conclusion :

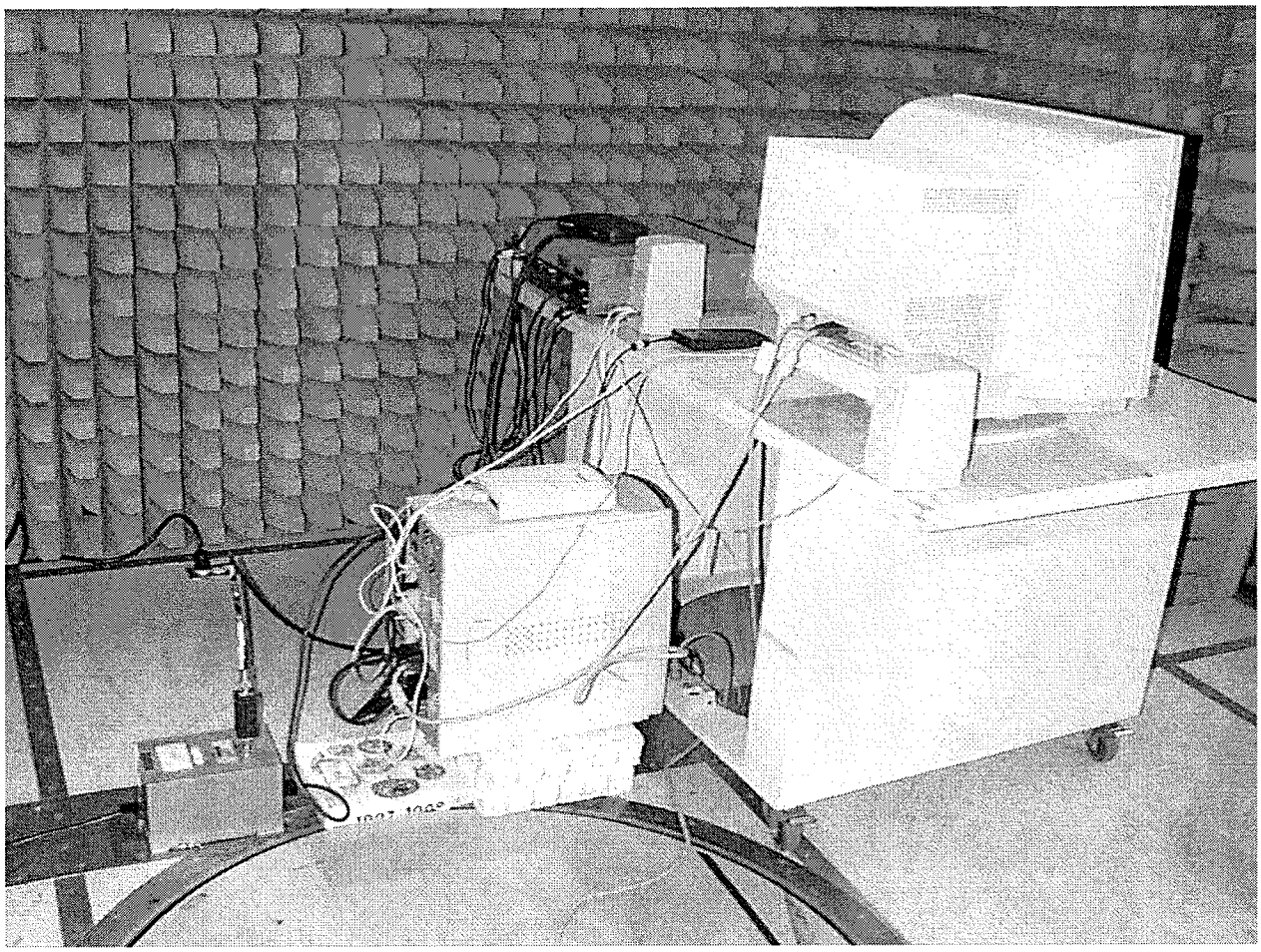
The EUT met criteria B.

23.4 SURGE TEST NOTES

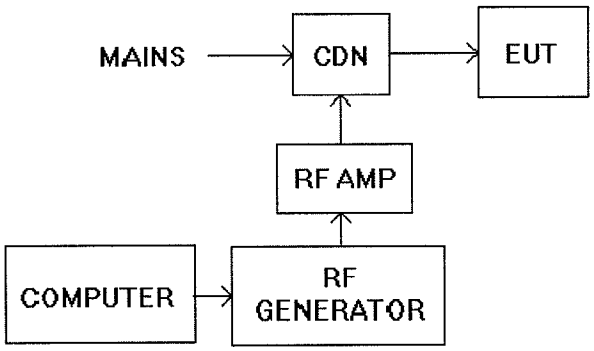
The PC rebooted after the third surge and worked normally afterword.

24 Appendix F: EN61000-4-6 Conducted Immunity

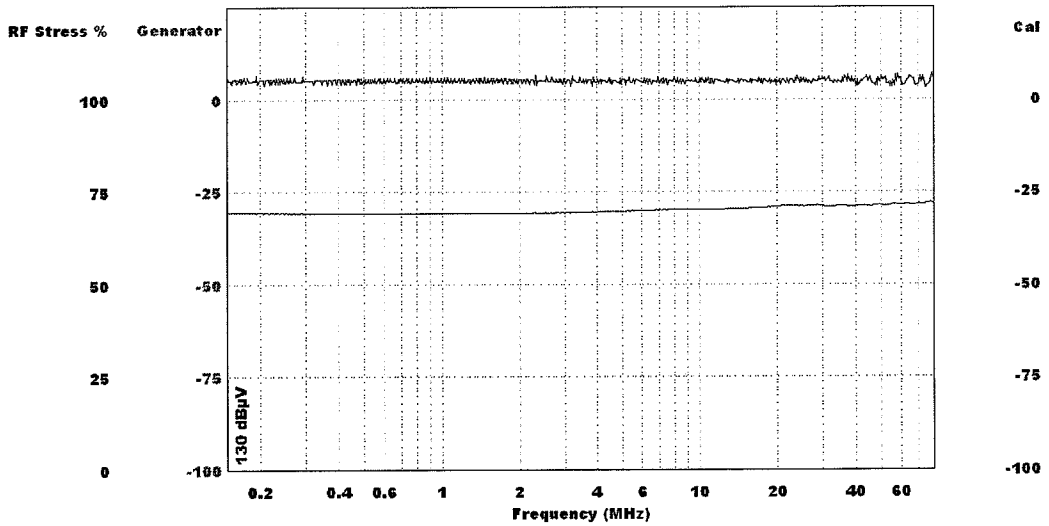
24.1 Test Configuration Photograph



24.2 Test Setup



24.3 RF Stress Applied

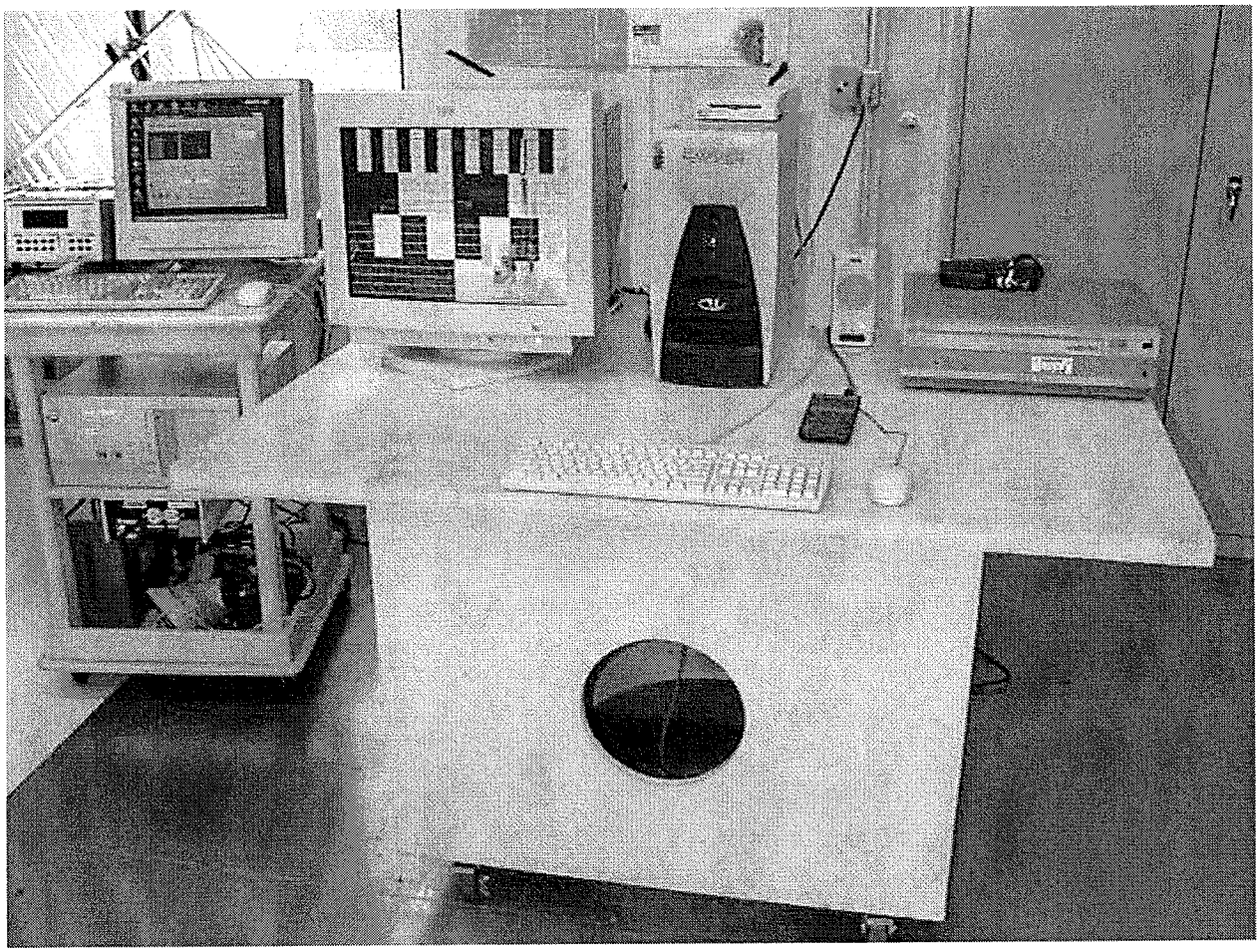


24.4 EN6100-4-6 Test results

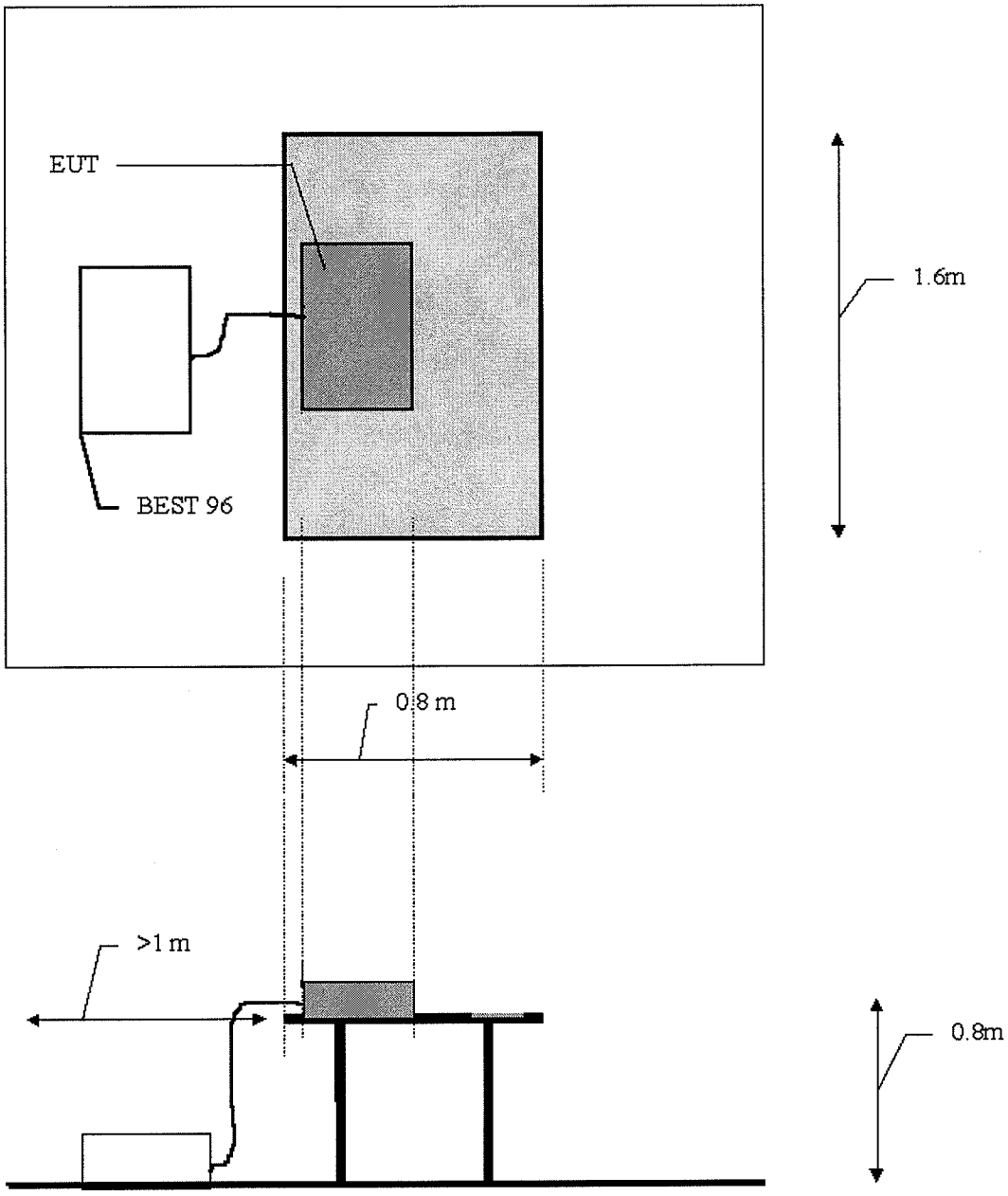
The EUT met criteria 1 in maintaining normal performance during and after the test.

25 Appendix G: EN61000-4-11 Voltage dips, short interruptions and variations immunity tests

25.1 Test Configuration Photographs



25.2 Test Setup



25.3 EN61000-4-11 Test Results

PQF Worksheet

Date : **Completed by : Vianney Saindon**
(aa / mm / jj)
Equipment to test : RT2000/KIT/N **Standard :** ☒ **EN61000-4-11:1995**
☒ **EN55024 :1998**
Other : N/A
EUT Number :367 **Temp :22°C** (15 to 35 °C) **Humid : 42 %** (25 to 75 %)
Barometric pressure : 100.92 kPa (86 to 106 kPa)

Part 1:

Voltage dip of of more than 95 % (< 5 % normal voltage) for 10 ms, 0 degrees crossing.

Number of repetitions : ☒ 3 ☐ Other ____ (3 minimum)

Interval : ☒ 15 second ☐ Other ____ second

Behavior: ☒ A ☐ ***B*** ☐ C ☐ D ☐ Notes below

Part 2:

Voltage dip of 30 % (70 % normal voltage) for 500 ms, 0 degrees crossing.

Number of repetitions : ☒ 3 ☐ Other ____ (3 minimum)

Interval : ☒ 15 second ☐ Other ____ second

Behavior: ☒ A ☐ B ☐ ***C*** ☐ D ☐ Notes below

Part 3:

Voltage interruption of more than 95 % (< 5 % normal voltage) for 5000 ms

Number of repetitions : ☒ 3 ☐ Other ____ (3 minimum)

Interval : ☐ 240 second ☒ Other 300 second

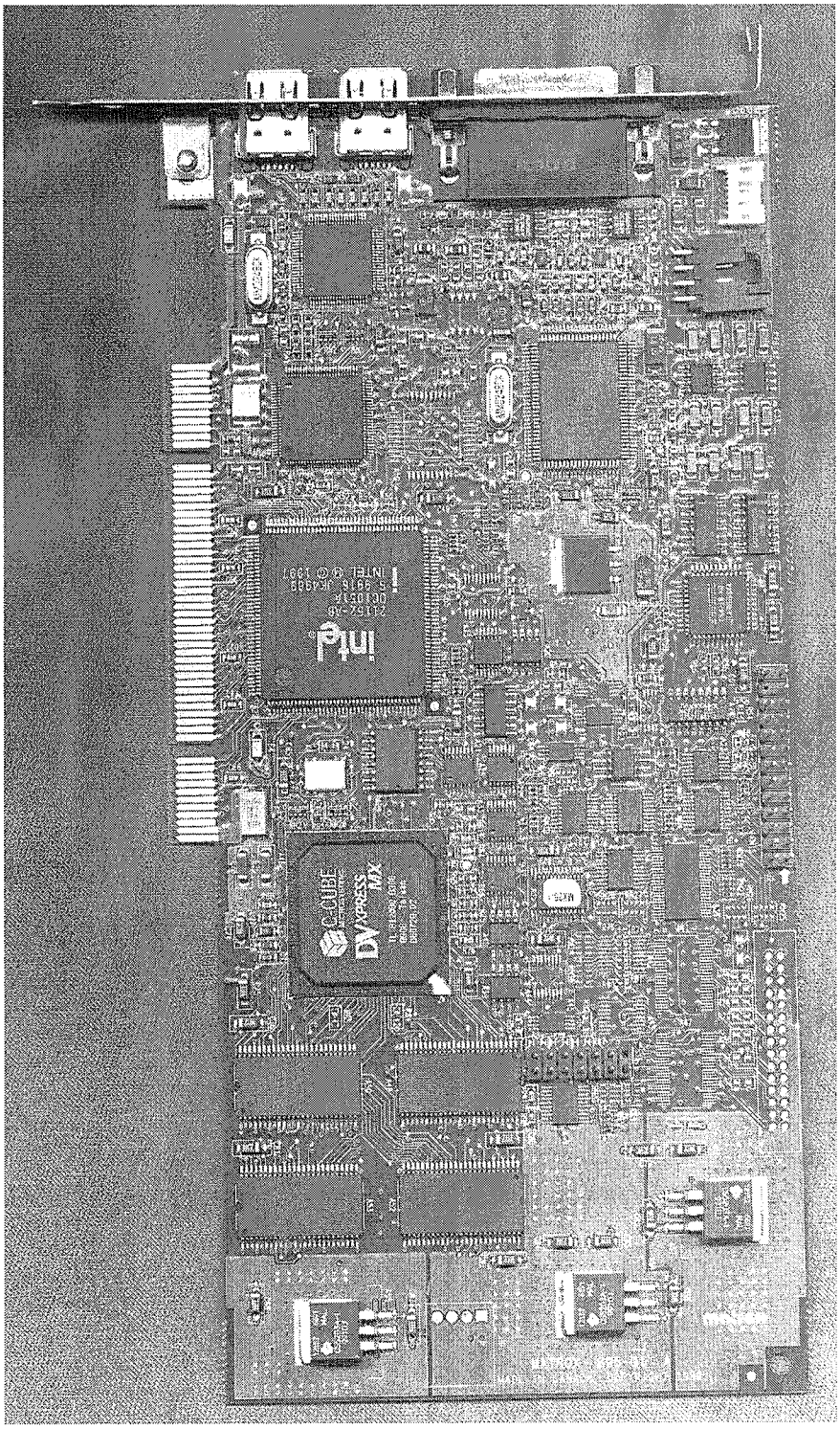
Behavior: ☐ A ☐ B ☒ ***C*** ☐ D ☐ Notes below

Conclusion :

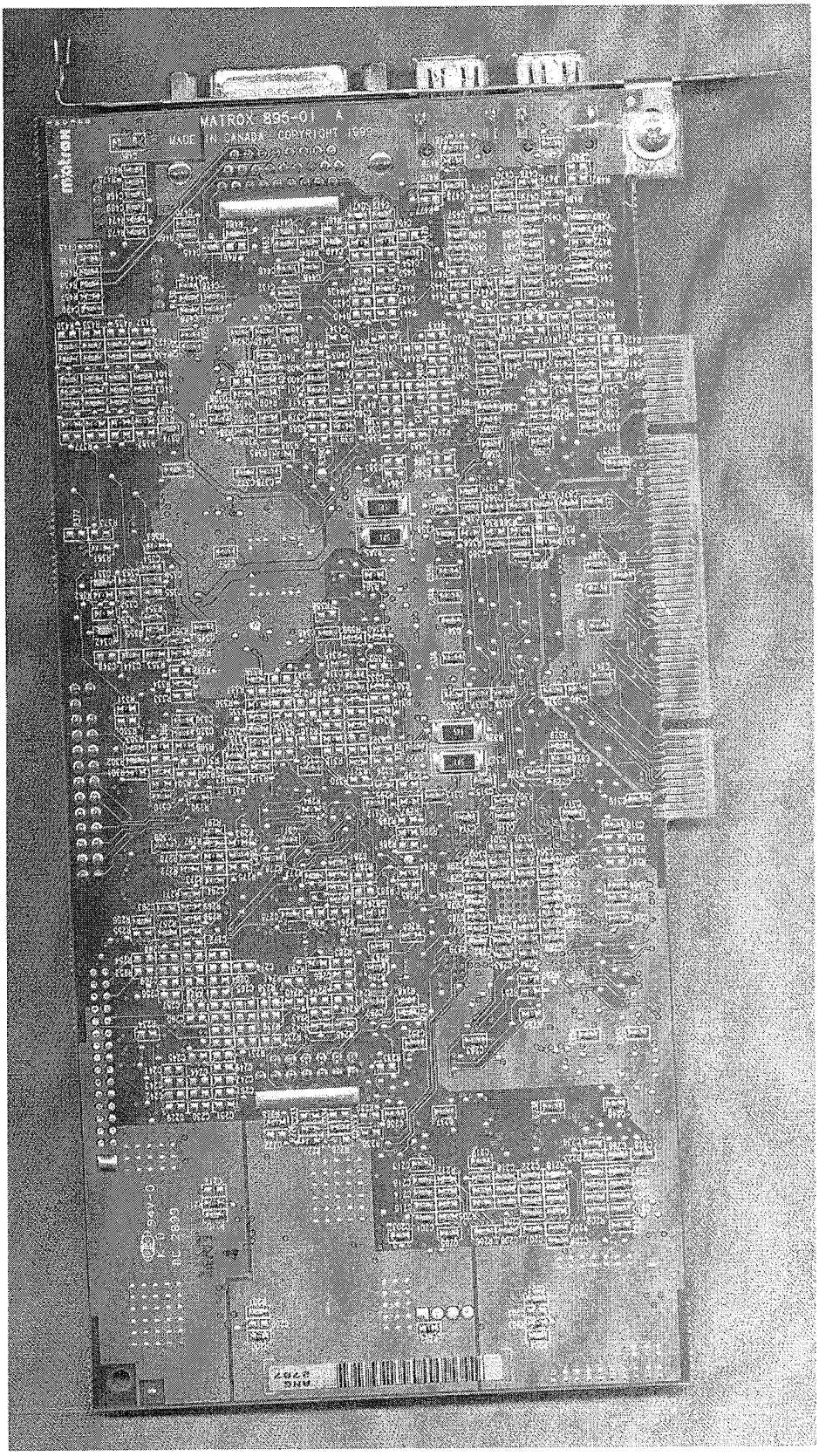
EUT met criteria A for parts 1&2, C for part 3.

26 Appendix H: PCB Photographs

26.1 Component side



26.2 Solder Side



27 Appendix I: User Manual

SEE SEPARATE ENCLOSURE FOR THE OPERATION MANUAL.

The enclosed manual is for the RT2000/KIT/N

5 BLOCK DIAGRAM(S) OF EUT

5.1 Block Diagram Description of the Graphic board

Figure 4.1 depicts the block diagram of the RT2000/KIT/N board:

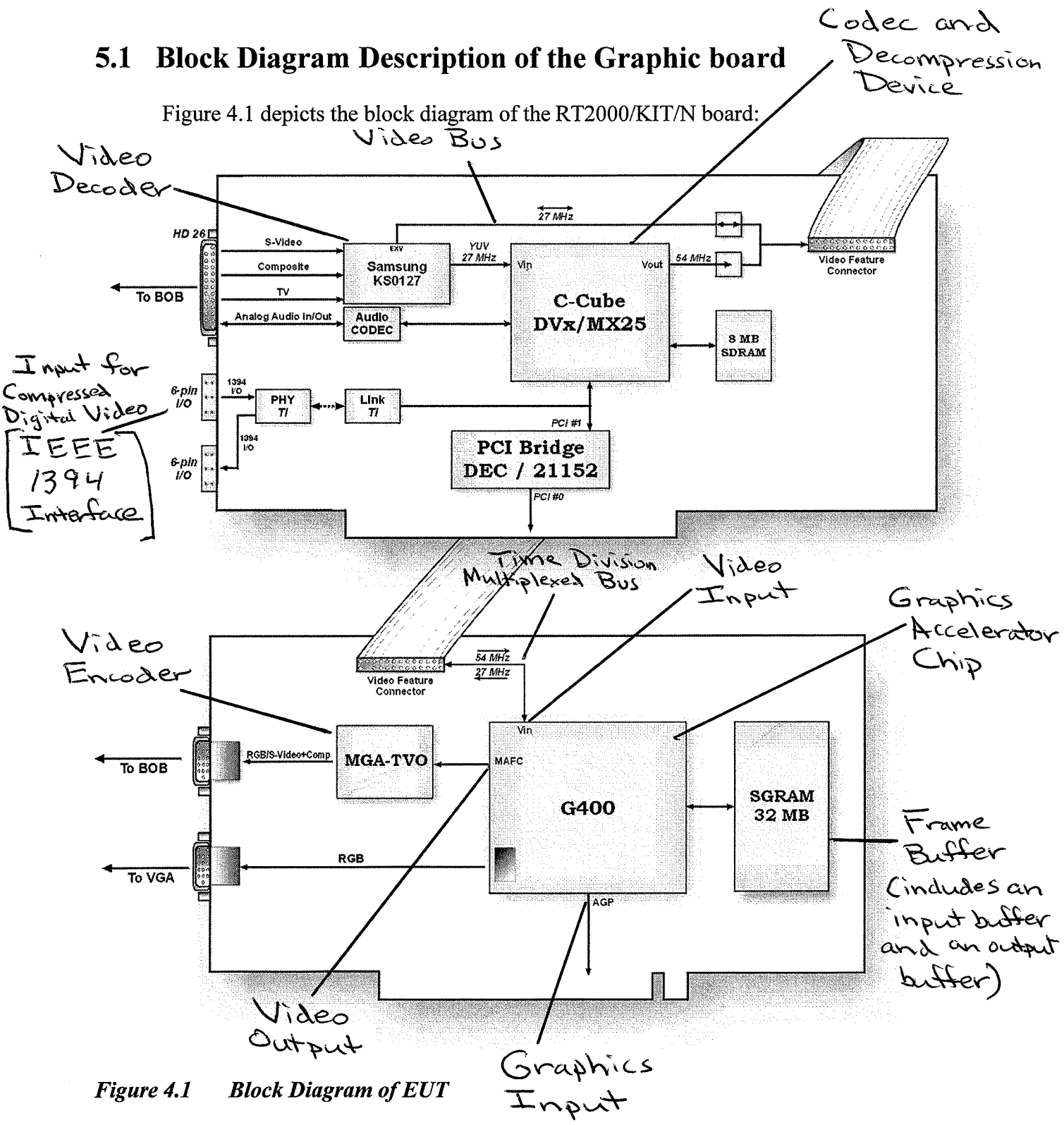


Figure 4.1 Block Diagram of EUT

EXHIBIT C

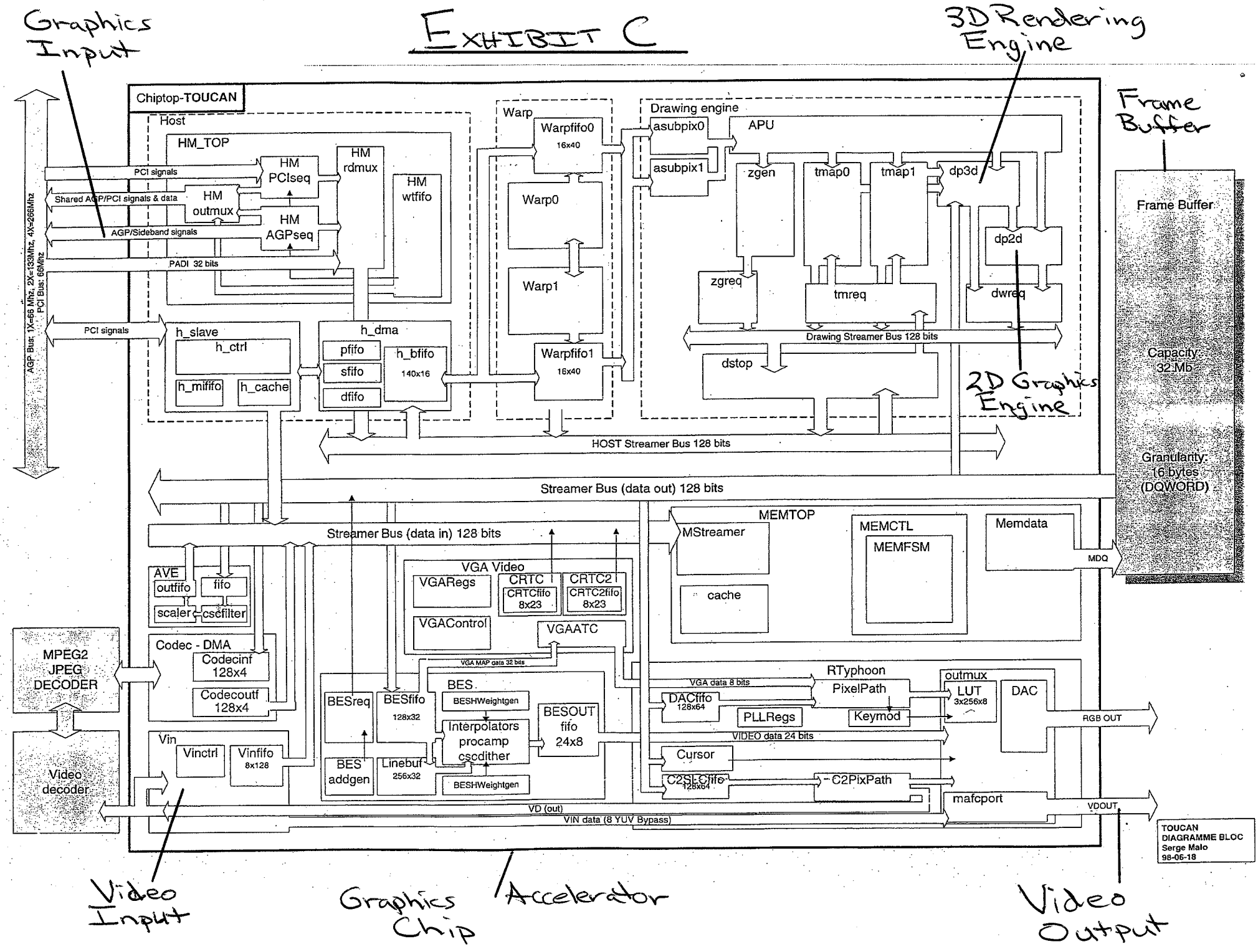

Graphics Input
3D Rendering Engine
Frame Buffer
Chiptop-TOUCAN
Host
HM_TOP
HM PCIseq
HM rdmux
HM wtfifo
HM outmux
HM AGPseq
PCI signals
Shared AGP/PCI signals & data
AGP/Sideband signals
PADI 32 bits
AGP Bus: 1X=66 Mhz, 2X=133Mhz, 4X=266Mhz
PCI Bus: 66Mhz
h_slave
h_ctrl
h_mfifo
h_cache
h_dma
pfifo
sfifo
dfifo
h_bfifo
140x16
Warp
Warpfifo0
16x40
Warp0
Warp1
Warpfifo1
16x40
Drawing engine
asubpix0
asubpix1
APU
zgen
tmap0
tmap1
dp3d
dp2d
zgreq
tmreq
dwreq
Drawing Streamer Bus 128 bits
dstop
2D Graphics Engine
HOST Streamer Bus 128 bits
Frame Buffer
Capacity: 32 Mb
Granularity: 16 bytes (DQWORD)
Streamer Bus (data out) 128 bits
Streamer Bus (data in) 128 bits
MEMTOP
MStreamer
cache
MEMCTL
MEMFSM
Memdata
MDQ
AVE
outfifo
fifo
scaler
cscfilter
VGA Video
VGARegs
CRTC
CRTCfifo 8x23
CRTC2
CRTC2fifo 8x23
VGAControl
VGAATC
VGA MAP data 32 bits
Codec - DMA
Codecinf 128x4
Codecoutf 128x4
MPEG2 JPEG DECODER
Video decoder
BES
BESreq
BESfifo
128x32
BESHWeightgen
Interpolators procamp cscdither
BESOUT fifo 24x8
BES addgen
Linebuf
256x32
BESHWeightgen
Vin
Vinctrl
Vinfifo
8x128
VD (out)
VIN data (8 YUV Bypass)
RTyphoon
VGA data 8 bits
PixelPath
DACfifo
128x64
PLLRegs
Keymod
outmux
LUT
3x256x8
DAC
RGB OUT
VIDEO data 24 bits
Cursor
C2SLCfifo
128x64
C2PixPath
mafcport
VDOUT
TOUCAN
DIAGRAMME BLOC
Serge Malo
98-05-18
Video Input
Graphics Chip Accelerator
Video Output

EXHIBIT D

matrox

Groupe Conformité

Rapport d'étape sur les essais effectués au laboratoire de conformité pour le

Marvel-Pro (RT2000)

Présenté au groupe:

Video

Pré-test selon les limites CISPR22 **B** et FCC classe **B**

0895-03 Rév.: **A**
Numéro de Série: **AQ01559**

0906-01 Rév.: **A**
Numéro de Série: **AP20673**

Numéro de Projet
0895_03_01

Groupe Conformité

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1. Description

1.1 Produit

Groupe:	Video	
Nom du produit:	Marvel-Pro (RT2000)	
Numéro de projet:	0895_03_01	
Nom du premier PCB:	Marvel-Pro	
Numéros et révision du premier PCB:	0895-03	Rév.: A
Numéro série du premier PCB:	AQ01559	
Nom du Deuxième PCB:	G4+MDHA32G/VPG	
Numéros et révision du deuxième PCB:	0906-01	Rév.: A
Numéro série du deuxième PCB:	AP20673	

1.2 Classes de Certification

CISPR22 classe B FCC classe B

1.3 Date de Début des Tests

1.4 Contact

Nom de la personne à contacter:	François Germain
Numéro de téléphone:	2884

2. Équipement D'essai

1. Énumérez l'équipement du laboratoire utilisé pour effectuer les tests.

Name	Manufacturer	Model	Serial #	Cal. Due Date yyyy/mm/dd	Used
Semi-Anechoic Chamber	EMC Test System	AP00025	11381		☒
EMI Receiver	Hewlett Packard	8546A	3801A00425		☒
RF Filter section	Hewlett Packard	85460A	3704A00330		☒
EMI Receiver	Hewlett Packard	8542E	3617A00169		☒
RF Filter section	Hewlett Packard	85420E	3427A00153		☒
Biconilog Antenna	EMCO	3142	9606-1041		☒
Biconilog Antenna	CHASE	CBL6112A	2277		☐
Biconilog Antenna	CHASE	CBL6112B	2410		☒
Horn Antenna	EMCO	3115	9908-5870		☐
Muti-Device Controller	EMCO	2090	9605-1134		☒
Muti-Device Controller	EMCO	2090	9605-1135		☒
Antenna Tower	EMCO	2070	9606-1974		☒
Antenna Tower	EMCO	2070	9606-1973		☒
Turntable	EMCO	2081	9605-1897		☒
Turntable	EMCO	2065	9605-1890		☒
Power Meter	Hewlett Packard	437B	3125U24265		☒
Power Sensor	Hewlett Packard	8442A	3318A29448		☒
Signal Generator	Rohde&Schwarz	SMY01	DE15017		☒
Function Generator	B&K Precision	3010	8739380		☒
RF Amplifier	Amplifier Research	30W1000M7	20720		☒
RF Amplifier	Amplifier Research	25A250A	20666		☒
Directional Coupler	Werlatone	02630	5584		☒
LISN	Solar Electronics	8012-50-R-24-BNC	887185		☒
LISN	Solar Electronics	8012-50-R-24-BNC	935435		☒
LISN	EMCO	3816/2	9605-1042		☒
Power Analyzer	AV Power	PA2200	605-0297		☒
Reference Impedance	AV Power	Option 48	606-0297		☒
AC Power Source	California Instruments	1251P	L05214		☒
AC Power Source	California Instruments	1251P-232	L06741		☒
EMC Test Instrument	Schaffner	Best '96 V3.9	IN4696-011		☒
Coupling Clamp	Schaffner	CDN 125	661		☐
C/D Network	CHASE	CDN-1000-M3-16	9714		☒
EM Injection Clamp	CHASE	CIC-8110	04		☐
Absorbing Clamp	FCC	F-201-23mm	33		☐
ESD Gun	Schaffner	N/A	NR224		☒

3. Équipement Sous Essai

Énumérez l'équipement utilisé pour effectuer les tests incluant le EUT. Indiquer le EUT par le chiffre 1 entre parenthèses. (Faire la liste en anglais pour pouvoir l'exporter dans le rapport final).

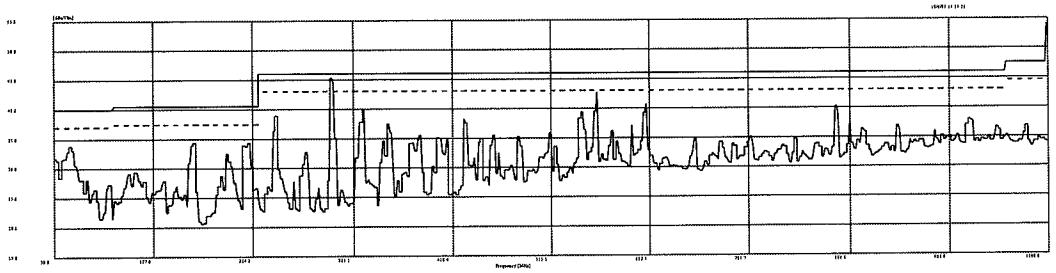
DESCRIPTION	MANUFACT	MODEL	SERIAL NO	FCC ID	SUPPLY CABLE DESCRIPTION	I/O CABLE DESCRIPTION

4. Modes à Évaluer

Énumérez tous les modes et résolutions à évaluer.

Mode 1: DUAL STREAM PLAYBACK WITH LIVE EFFECTS

4.1 Graphique Large Bande 30 MHz à 1 GHz Mode 1: DUAL STREAM PLAYBACK WITH LIVE EFFECTS



4.1.1 Données

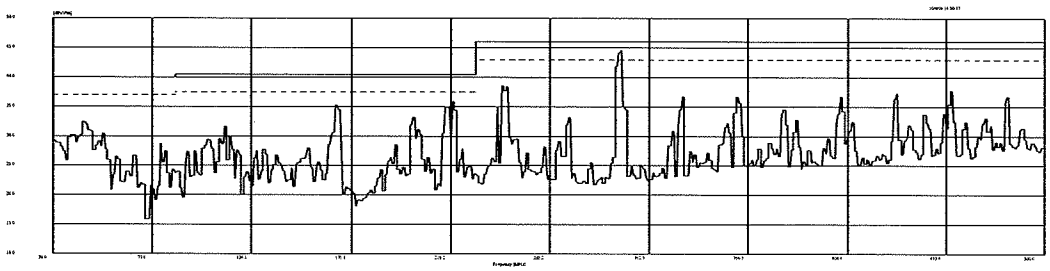
Date :

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
44.550000	100	332	Vert	33.78	40.00	-6.22	PASS
165.800000	100	84	Horz	34.34	40.50	-6.16	PASS
197.325000	100	140	Horz	32.51	40.50	-7.99	PASS
219.150000	100	84	Horz	34.35	40.50	-6.15	PASS
245.825000	100	185	Horz	38.89	46.00	-7.11	PASS
299.175000	**100**	**154**	**Horz**	**45.27**	**46.00**	**-0.73**	**PASS**
330.700000	100	169	Horz	39.92	46.00	-6.08	PASS
354.950000	100	258	Horz	37.43	46.00	-8.57	PASS
430.125000	100	44	Vert	38.24	46.00	-7.76	PASS
546.525000	100	169	Horz	39.33	46.00	-6.67	PASS
561.075000	100	185	Horz	42.65	46.00	-3.35	PASS
575.625000	100	169	Horz	36.17	46.00	-9.83	PASS
609.575000	100	185	Horz	40.73	46.00	-5.27	PASS
793.875000	100	112	Horz	40.15	46.00	-5.85	PASS
808.425000	100	185	Horz	37.54	46.00	-8.46	PASS
820.550000	100	348	Vert	36.10	46.00	-9.90	PASS
854.500000	100	44	Vert	36.64	46.00	-9.36	PASS
924.825000	100	1	Vert	37.93	46.00	-8.07	PASS

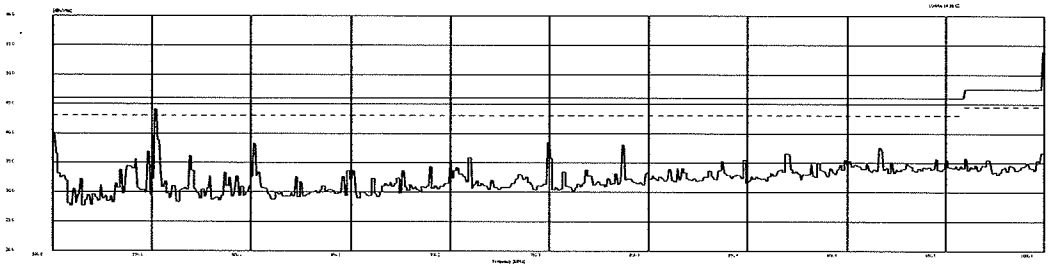
5. Mode à Tester:DUAL STREAM PLAYBACK WITH LIVE EFFECTS

5.1 Graphique de 30MHz à 500MHz

Date :



5.2 Graphique de 500MHz à 1000MHz



5.3 Réduction

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
163.950000	152	77	Horz	35.25	40.50	-5.25	PASS
200.375000	152	128	Horz	33.06	40.50	-7.44	PASS
219.175000	152	67	Horz	35.88	40.50	-4.62	PASS
299.075000	152	137	Horz	44.61	46.00	-1.39	PASS
551.250000	248	196	Horz	44.16	46.00	-1.84	PASS
750.000000	248	148	Vert	38.48	46.00	-7.52	PASS

5.4 Maximisation FCC 3m

Date :

Frequency	Hgt	Ang	Pol	Cab	Ant F	Tot C	QP	QP Lmt	ΔL-QP	Status
MHz	cm	deg		dB	dB/m	dB	dBuV/m	dBuV/m	dB	
162.002436	202	75	Horz	0.45	8.80	9.25	35.87	43.50	-7.63	PASS
196.624881	157	126	Horz	0.46	11.37	11.82	33.24	43.50	-10.26	PASS
215.998648	158	67	Horz	0.57	11.28	11.85	35.35	43.50	-8.15	PASS
294.942735	127	135	Horz	0.91	13.20	14.10	45.28	46.00	-0.72	1394
550.531576	228	194	Vert	1.17	19.40	20.57	34.38	46.00	-11.62	PASS
749.709861	202	156	Vert	1.42	21.59	23.01	21.25	46.00	-24.75	PASS

5.5 Maximisation CE 3m

Date :

Frequency	Hgt	Ang	Pol	Cab	Ant F	Tot C	QP	QP Lmt	ΔL-QP	Status
MHz	cm	deg		dB	dB/m	dB	dBuV/m	dBuV/m	dB	
162.002436	202	75	Horz	0.45	8.80	9.25	35.87	40.50	-4.63	PASS
196.624881	157	126	Horz	0.46	11.37	11.82	33.24	40.50	-7.26	PASS
215.998648	158	67	Horz	0.57	11.28	11.85	35.35	40.50	-5.15	PASS
294.942735	127	135	Horz	0.91	13.20	14.10	45.28	47.50	-2.22	PASS
550.531576	228	194	Vert	1.17	19.40	20.57	34.38	47.50	-13.12	PASS
749.709861	202	156	Vert	1.42	21.59	23.01	21.25	47.50	-26.25	PASS

5.6 Maximisation CE 10m

Date

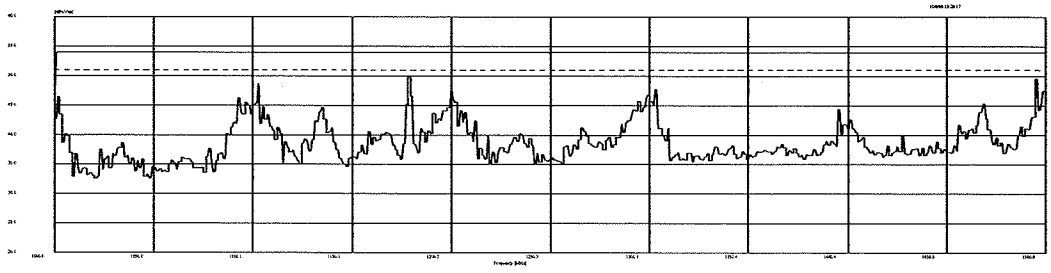
5.7 Rappel : Prise de photographies des tests à 3m et à 10m

OK 3m VS

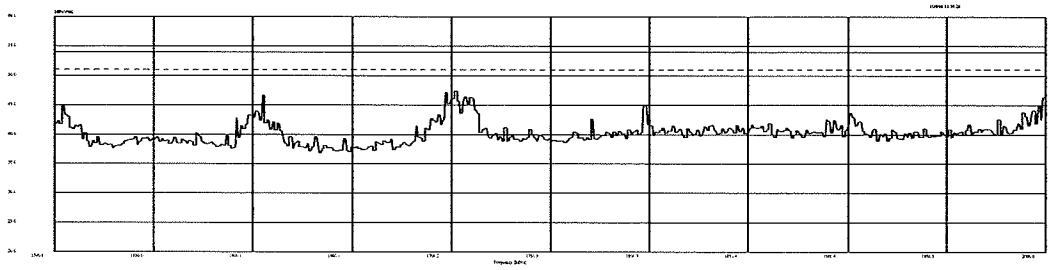
5.7.1 Commentaire

~~7.~~6. Test Final au-dessus de 1GHz

~~7.16.1~~ Graphique de 1GHz à 1.5GHz



6.2 Graphique de 1.5GHz à 2GHz

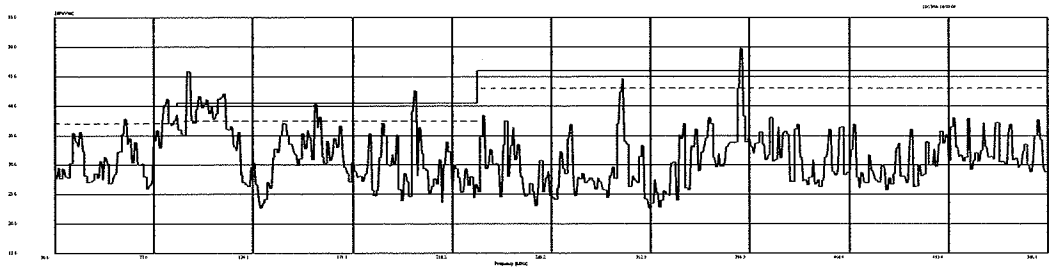


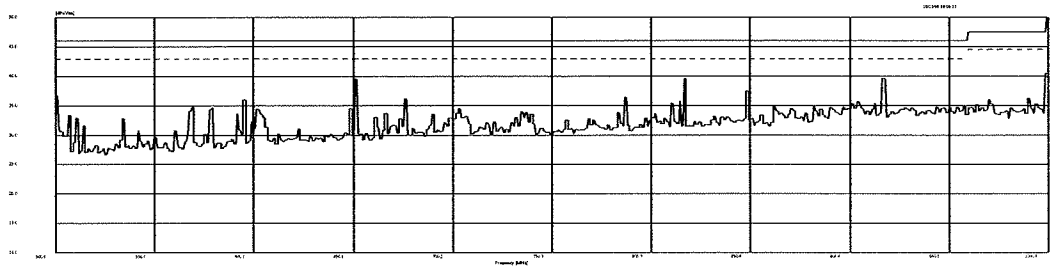
6.3 Données

Date :

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
1001.250000	248	350	Horz	46.50	54.00	-7.50	PASS
1092.500000	152	17	Horz	46.29	54.00	-7.71	PASS
1102.500000	152	54	Horz	48.66	54.00	-5.34	PASS
1135.000000	152	29	Horz	44.66	54.00	-9.34	PASS
1178.750000	152	88	Vert	49.86	54.00	-4.14	PASS
1200.000000	152	36	Vert	47.89	54.00	-6.11	PASS
1298.750000	152	23	Horz	46.30	54.00	-7.70	PASS
1303.750000	152	29	Horz	47.76	54.00	-6.24	PASS
1396.250000	152	164	Horz	44.44	54.00	-9.56	PASS
1470.000000	152	188	Horz	45.33	54.00	-8.67	PASS
1496.250000	152	26	Vert	49.58	54.00	-4.42	PASS
1503.750000	252	201	Vert	44.99	54.00	-9.01	PASS
1605.000000	152	182	Vert	46.69	54.00	-7.31	PASS

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
1702.500000	152	361	Vert	47.41	54.00	-6.59	PASS
1797.500000	152	202	Horz	45.11	54.00	-8.89	PASS





7. Reprise des tests sur le RT-2000 avec un mode de fonctionnement différent

Date :

7.1 Maximisation FCC B 3m

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Cablin g (dB)	Ant Fac (dB/m)	Tot Corr (dB)	QP (dBuV/ m)	QP Lmt (dBuV/ m)	DelLi m-QP (dB)	Status
60.599647	129	357	Vert	0.10	8.08	8.18	35.82	40.00	-4.18	PASS
84.221934	104	55	Vert	0.17	6.95	7.12	34.75	40.00	-5.25	PASS
90.994503	124	83	Vert	0.16	7.64	7.80	36.57	43.50	-6.93	PASS
108.799027	276	278	Horz	0.23	8.47	8.70	33.78	43.50	-9.72	PASS
135.456279	237	344	Horz	0.33	7.35	7.68	27.97	43.50	-15.53	PASS
151.925724	202	158	Vert	0.40	8.62	9.01	29.45	43.50	-14.05	PASS
196.624677	162	62	Horz	0.46	11.37	11.82	38.92	43.50	-4.58	PASS
294.940240	100	311	Horz	0.91	13.20	14.10	42.29	46.00	-3.71	PASS
351.005015	102	314	Vert	1.05	15.32	16.37	30.57	46.00	-15.43	PASS

7.2 Maximisation CE B 3m

Frequency	Hgt	Angle	Pol	Cablin g	Ant Fac	Tot Corr	QP	QP Lmt	DelLi m-QP	Status
(MHz)	(cm)	(deg)		(dB)	(dB/m)	(dB)	(dBuV/ m)	(dBuV/ m)	(dB)	
60.599647	129	357	Vert	0.10	8.08	8.18	35.82	40.50	-4.68	PASS
84.221934	104	55	Vert	0.17	6.95	7.12	34.75	40.50	-5.75	PASS
90.994503	124	83	Vert	0.16	7.64	7.80	36.57	40.50	-3.93	PASS
108.799027	276	278	Horz	0.23	8.47	8.70	33.78	40.50	-6.72	PASS
135.456279	237	344	Horz	0.33	7.35	7.68	27.97	40.50	-12.53	PASS
151.925724	202	158	Vert	0.40	8.62	9.01	29.45	40.50	-11.05	PASS
196.624677	162	62	Horz	0.46	11.37	11.82	38.92	40.50	-1.58	PASS
294.940240	100	311	Horz	0.91	13.20	14.10	42.29	47.50	-5.21	PASS
351.005015	102	314	Vert	1.05	15.32	16.37	30.57	47.50	-16.93	PASS

7.3 Maximisation CE 10m

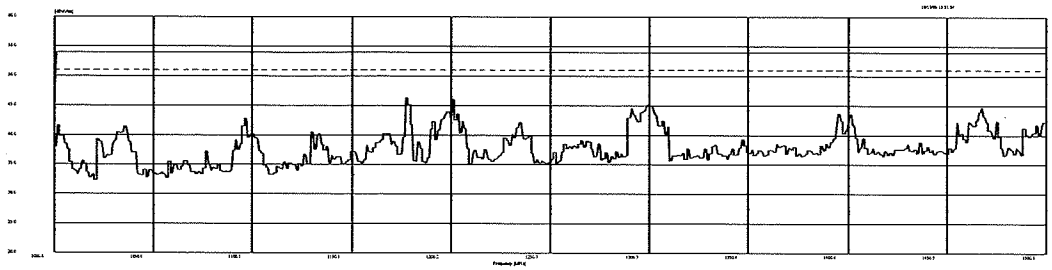
Date

Frequency	Hgt	Angle	Pol	Cabling	Ant Fac	Tot Corr	QP	QP Lmt	DelLi m-QP	Status
(MHz)	(cm)	(deg)		(dB)	(dB/m)	(dB)	(dBuV/ m)	(dBuV/ m)	(dB)	
60.604500	180	357	Vert	0.51	4.97	5.48	25.38	30.00	-4.62	PASS
84.215869	396	217	Horz	0.49	7.81	8.30	41.97	30.00	11.97	Ambient
90.994286	273	358	Horz	0.43	8.80	9.22	38.61	30.00	8.61	Ambient
108.800218	104	358	Vert	0.62	11.15	11.77	20.02	30.00	-9.98	PASS
135.454994	396	24	Vert	0.79	10.89	11.68	16.09	30.00	-13.91	PASS
151.928190	127	357	Vert	1.06	10.09	11.16	26.35	30.00	-3.65	PASS
196.626983	295	2	Horz	1.42	8.93	10.35	43.32	30.00	13.32	ambient
294.941912	102	358	Vert	1.86	13.10	14.96	32.67	37.00	-4.33	PASS
351.008376	100	218	Vert	2.11	14.33	16.44	21.55	37.00	-15.45	PASS

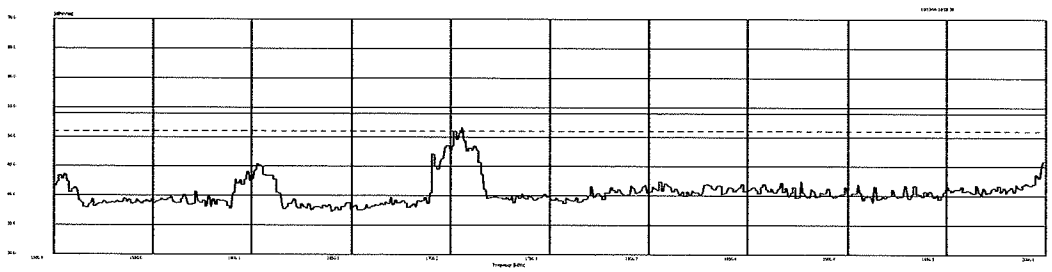
7.4 Extrapolation de 3m à 10m

Frequency	Hgt	Angle	Pol	Cabling	Ant Fac	Tot Corr	QP	QP Lmt	DelLi m-QP	Status
(MHz)	(cm)	(deg)		(dB)	(dB/m)	(dB)	(dBuV/ m)	(dBuV/ m)	(dB)	
84.215869	396	217	Horz	0.49	7.81	8.30	24.29	30.00	-5.71	PASS
90.994286	273	358	Horz	0.43	8.80	9.22	26.11	30.00	-3.89	PASS
196.626983	295	2	Horz	1.42	8.93	10.35	28.42	30.00	-1.58	PASS

7.5 Graphique de 1GHz à 1.5GHz



7.6 Graphique de 1.5GHz à 2GHz



7.7 Données

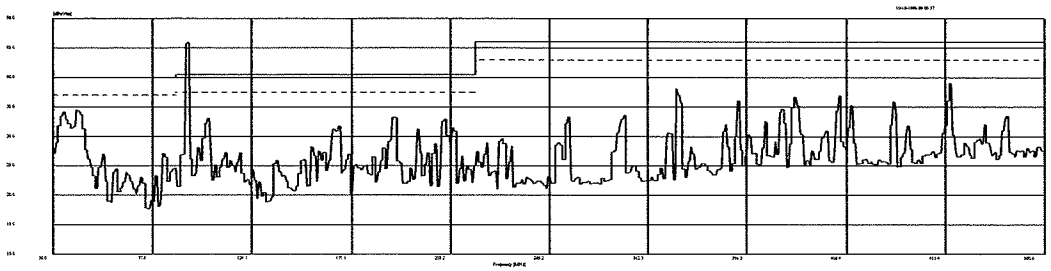
8. Date :

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
1177.500000	148	122	Horz	46.28	54.00	-7.72	PASS
1201.250000	148	359	Horz	46.11	54.00	-7.89	PASS
1300.000000	148	211	Horz	45.19	54.00	-8.81	PASS
1468.750000	148	182	Horz	44.77	54.00	-9.23	PASS
1602.500000	152	56	Horz	45.52	54.00	-8.48	PASS
1706.250000	152	358	Vert	50.61	54.00	-3.39	PASS
1712.500000	152	18	Vert	48.47	54.00	-5.53	PASS

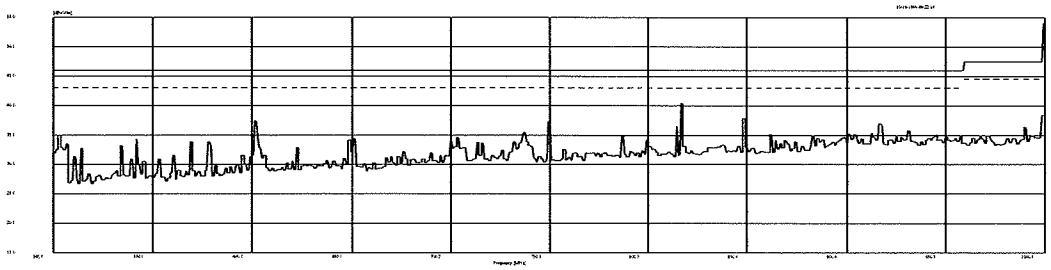
8. Essai de Différents Câbles Plats

8.1 Câble Original Ferrite Steward

8.1.1 Graphique de 30MHz à 500MHz



8.1.2 Graphique de 500MHz à 1000MHz



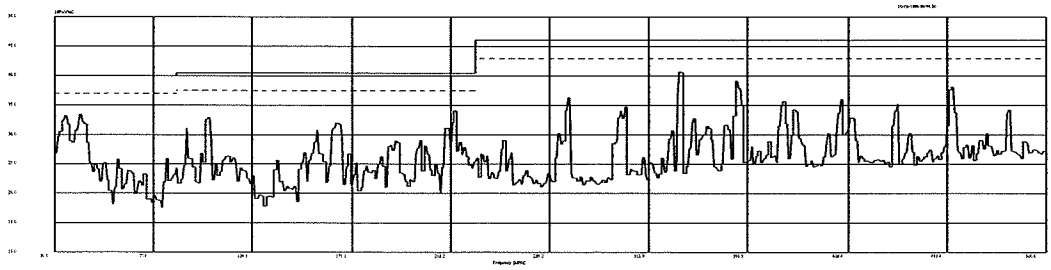
8.1.3 Données

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
34.700000	148	289	Vert	34.14	40.00	-5.86	PASS
40.575000	148	264	Vert	34.54	40.00	-5.46	PASS
93.450000	**148**	**148**	**Vert**	**45.96**	**40.50**	**5.46**	**MONITEUR SONY**
102.850000	248	269	Horz	33.16	40.50	-7.34	PASS
165.125000	148	254	Horz	31.51	40.50	-8.99	PASS
192.150000	148	242	Horz	33.24	40.50	-7.26	PASS
202.725000	148	156	Horz	31.24	40.50	-9.26	PASS
215.650000	148	304	Horz	32.85	40.50	-7.65	PASS
326.100000	148	327	Horz	38.13	46.00	-7.87	PASS
355.475000	148	254	Horz	36.15	46.00	-9.85	PASS
382.500000	148	83	Horz	36.70	46.00	-9.30	PASS
403.650000	148	327	Vert	36.76	46.00	-9.24	PASS

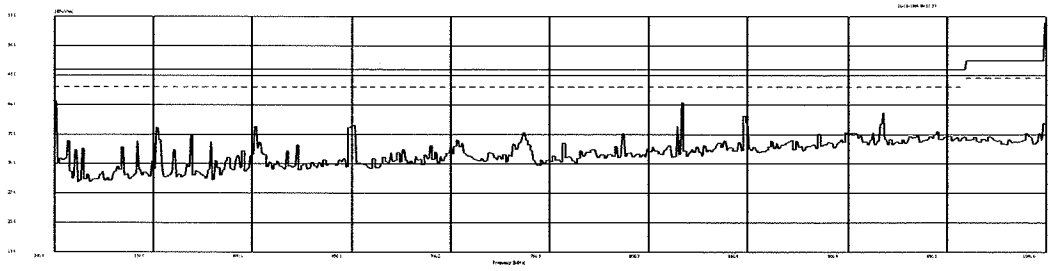
Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
456.525000	148	20	Vert	39.05	46.00	-6.95	PASS
601.250000	152	336	Vert	37.39	46.00	-8.61	PASS
750.000000	152	201	Vert	37.28	46.00	-8.72	PASS
817.500000	252	347	Horz	40.42	46.00	-5.58	PASS
848.750000	252	354	Vert	37.89	46.00	-8.11	PASS
917.500000	152	13	Vert	37.02	46.00	-8.98	PASS

8.2 Câble avec Ferrite ?

8.2.1 Graphique de 30MHz à 500MHz



8.2.2 Graphique de 500MHz à 1000MHz



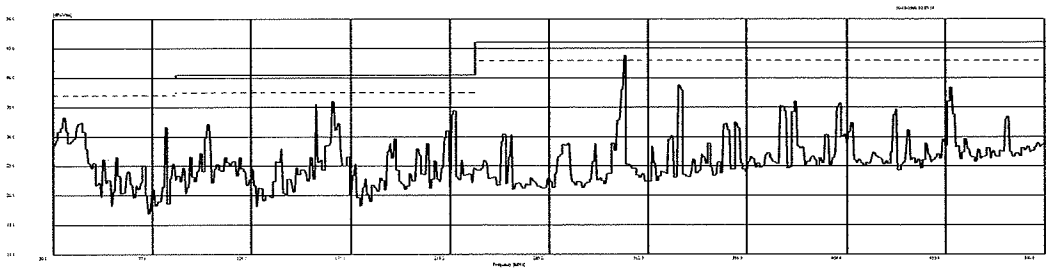
8.2.3 Données

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
34.700000	150	256	Vert	33.23	40.00	-6.77	PASS
41.750000	150	270	Vert	33.52	40.00	-6.48	PASS
92.275000	150	142	Vert	31.06	40.50	-9.44	PASS
102.850000	248	272	Horz	32.70	40.50	-7.80	PASS
154.550000	248	119	Horz	30.77	40.50	-9.73	PASS
163.950000	248	259	Horz	32.02	40.50	-8.48	PASS

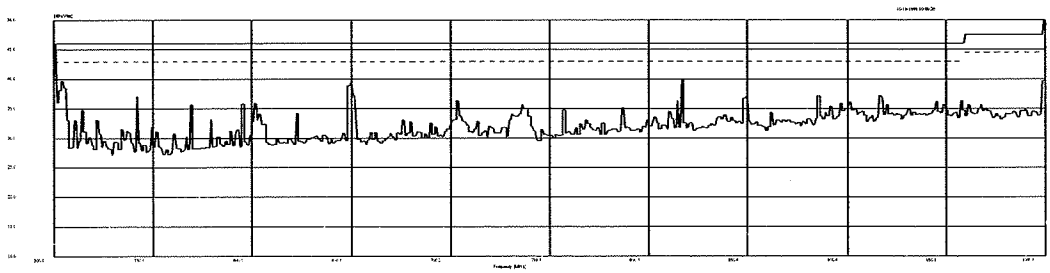
Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
215.650000	150	311	Horz	31.20	40.50	-9.30	PASS
220.350000	150	243	Vert	34.03	40.50	-6.47	PASS
274.400000	150	270	Vert	36.24	46.00	-9.76	PASS
327.275000	150	215	Horz	40.79	46.00	-5.21	PASS
354.300000	248	147	Horz	39.18	46.00	-6.82	PASS
403.650000	150	325	Vert	36.13	46.00	-9.87	PASS
456.525000	150	30	Vert	38.16	46.00	-7.84	PASS
551.250000	152	205	Horz	36.14	46.00	-9.86	PASS
601.250000	152	351	Vert	36.40	46.00	-9.60	PASS
651.250000	252	326	Horz	36.57	46.00	-9.43	PASS
817.500000	252	1	Horz	40.10	46.00	-5.90	PASS
848.750000	252	1	Vert	38.12	46.00	-7.88	PASS
918.750000	152	362	Vert	38.77	46.00	-7.23	PASS

8.3 Câble sans Ferrite

8.3.1 Graphique de 30MHz à 500MHz



8.3.2 Graphique de 500MHz à 1000MHz



8.3.3 Données

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status

34.700000	150	241	Vert	33.34	40.00	-6.66	PASS
42.925000	150	279	Vert	32.37	40.00	-7.63	PASS
82.875000	150	307	Horz	31.62	40.00	-8.38	PASS
102.850000	248	264	Horz	32.16	40.50	-8.34	PASS
154.550000	150	106	Horz	35.56	40.50	-4.94	PASS
162.775000	150	152	Horz	36.00	40.50	-4.50	PASS
220.350000	150	232	Vert	34.26	40.50	-6.24	PASS
301.425000	**150**	**322**	**Horz**	**43.81**	**46.00**	**-2.19**	**PASS**
327.275000	150	213	Horz	38.80	46.00	-7.20	PASS
382.500000	150	288	Vert	36.04	46.00	-9.96	PASS
456.525000	150	34	Vert	38.16	46.00	-7.84	PASS
541.250000	152	265	Vert	37.07	46.00	-8.93	PASS
650.000000	152	178	Horz	39.22	46.00	-6.78	PASS
703.750000	152	178	Horz	36.36	46.00	-9.64	PASS
817.500000	252	12	Horz	40.05	46.00	-5.95	PASS
850.000000	152	1	Vert	36.90	46.00	-9.10	PASS
886.250000	152	148	Vert	37.15	46.00	-8.85	PASS
902.500000	152	318	Vert	36.07	46.00	-9.93	PASS
917.500000	152	41	Vert	37.22	46.00	-8.78	PASS

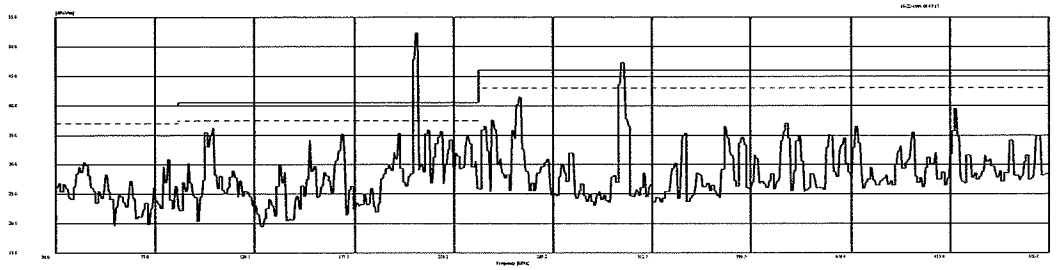
8.3.3.1 Conclusion

Les deux câbles avec ferrite sont équivalent. Celui sans ferrite ne passe pas à 297MHz (11^{e} harmonique de 27MHz). Le dernier n'est donc pas acceptable.

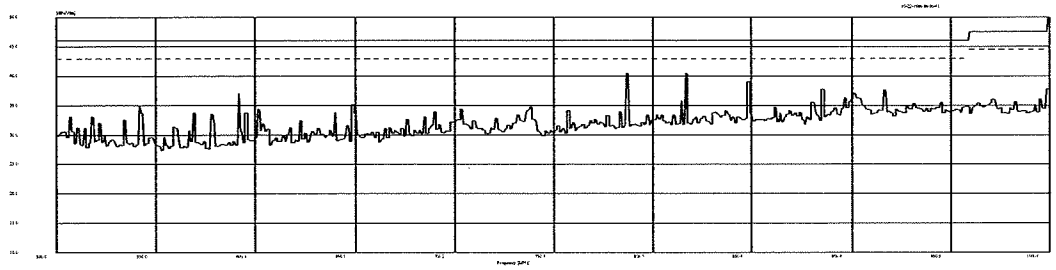
9. Essais sur Différents Câbles IEEE-1394

9.1 Câble JEM Hannstar

9.1.1 Graphique de 30MHz à 500MHz



9.1.2 Graphique de 500MHz à 1000MHz

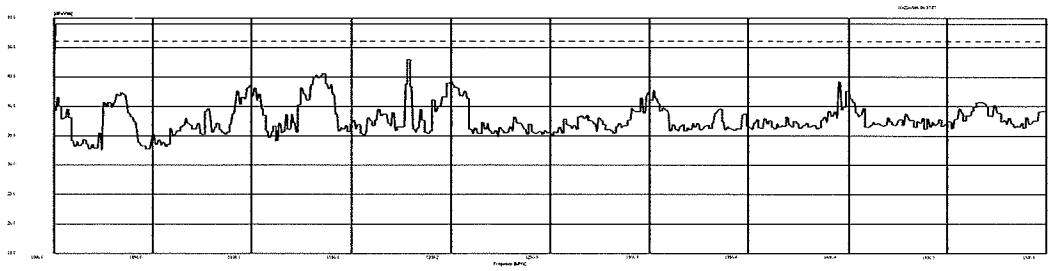


9.1.3 Données

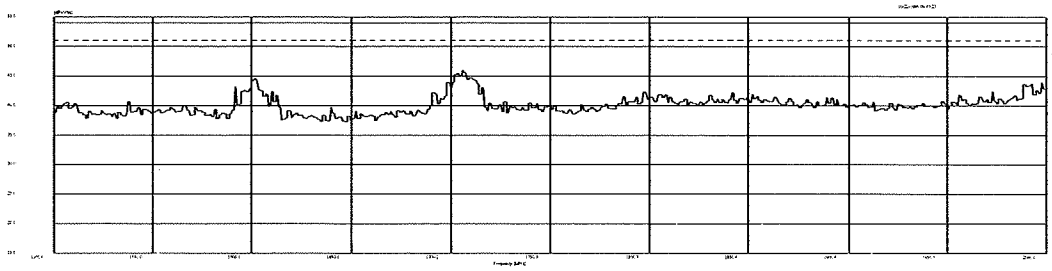
Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
42.925000	249	332	Vert	30.44	40.00	-9.56	PASS
82.875000	149	276	Vert	30.89	40.00	-9.11	PASS
92.275000	149	157	Vert	30.23	40.50	-10.27	PASS
104.025000	149	80	Vert	36.31	40.50	-4.19	PASS
135.750000	149	112	Horz	30.04	40.50	-10.46	PASS
149.850000	149	285	Horz	34.11	40.50	-6.39	PASS
165.125000	149	99	Horz	35.16	40.50	-5.34	PASS
192.150000	149	218	Horz	35.28	40.50	-5.22	PASS
200.375000	**149**	**256**	**Horz**	**52.33**	**40.50**	**11.83**	**8^{e} du IEEE-1394**
206.250000	149	266	Horz	35.90	40.50	-4.60	PASS
212.125000	149	187	Horz	35.58	40.50	-4.92	PASS
216.825000	149	86	Horz	34.22	40.50	-6.28	PASS

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
225.050000	149	163	Horz	34.79	40.50	-5.71	PASS
236.800000	149	175	Horz	37.54	46.00	-8.46	PASS
249.725000	149	163	Horz	41.50	46.00	-4.50	PASS
297.900000	**149**	**137**	**Horz**	**47.36**	**46.00**	**1.36**	**12e du IEEE-1394**
347.250000	249	190	Horz	36.45	46.00	-9.55	PASS
376.625000	149	357	Vert	37.02	46.00	-8.98	PASS
409.525000	149	246	Horz	36.51	46.00	-9.49	PASS
456.525000	149	70	Vert	39.53	46.00	-6.47	PASS
591.250000	152	35	Vert	37.11	46.00	-8.89	PASS
787.500000	152	98	Vert	40.47	46.00	-5.53	PASS
817.500000	252	16	Horz	40.50	46.00	-5.50	PASS
848.750000	152	1	Vert	39.07	46.00	-6.93	PASS
886.250000	152	161	Horz	37.81	46.00	-8.19	PASS
902.500000	152	35	Vert	37.07	46.00	-8.93	PASS
917.500000	152	354	Vert	37.67	46.00	-8.33	PASS

9.1.4 Graphique de 1000MHz à 1500MHz



9.1.5 Graphique de 1500MHz à 2000MHz



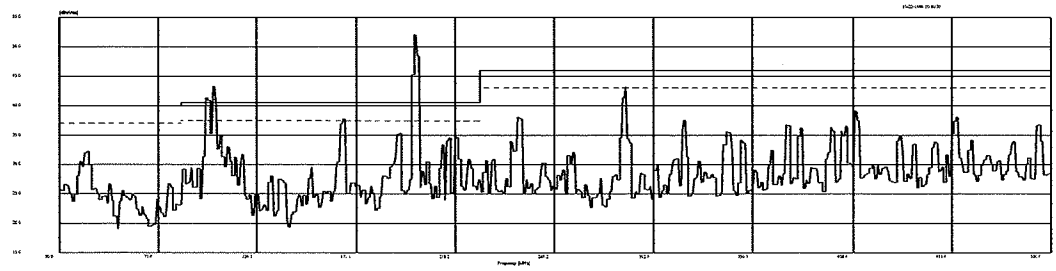
9.1.6 Données

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status

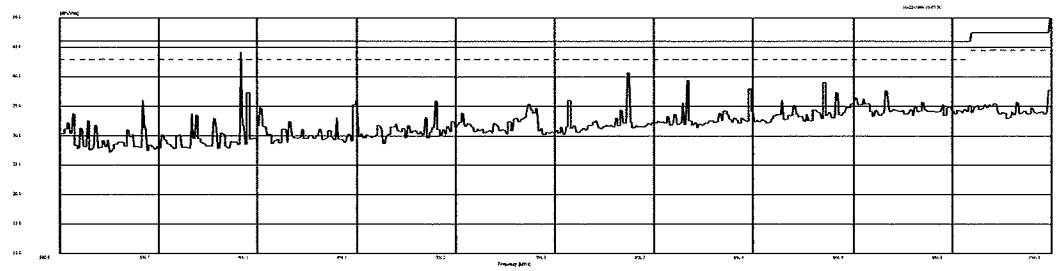
1136.250000	150	0	Horz	45.51	54.00	-8.49	PASS
1178.750000	150	166	Vert	47.98	54.00	-6.02	PASS
1200.000000	150	17	Horz	44.31	54.00	-9.69	PASS
1396.250000	150	195	Vert	44.19	54.00	-9.81	PASS
1601.250000	152	29	Vert	44.52	54.00	-9.48	PASS
1706.250000	152	361	Vert	45.69	54.00	-8.31	PASS
1998.750000	152	24	Vert	44.00	54.00	-10.00	PASS

9.2 Câble AWM

9.2.1 Graphique de 30MHz à 500MHz



9.2.2 Graphique de 500MHz à 1000MHz

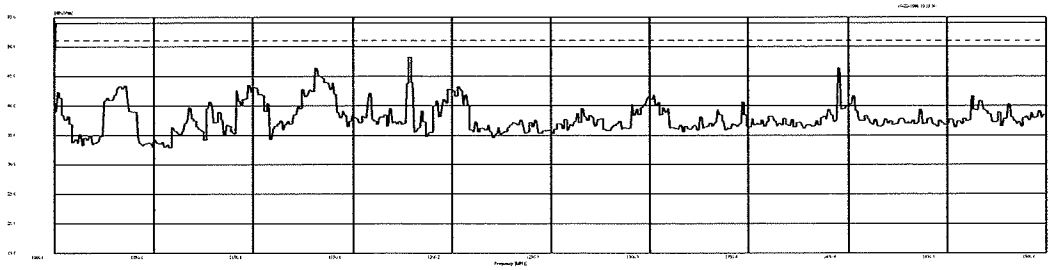


9.2.3 Données

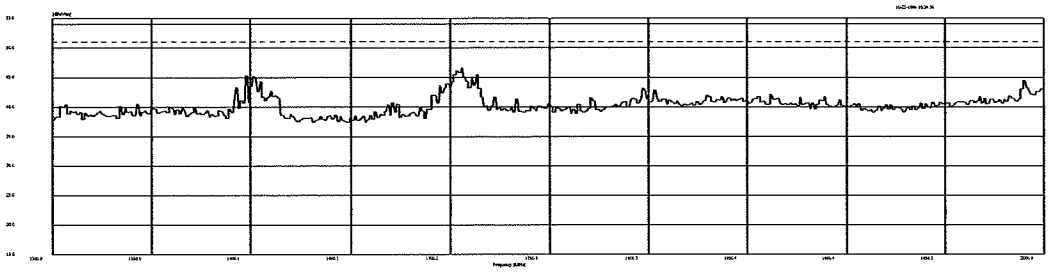
Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
42.925000	150	344	Vert	32.30	40.00	-7.70	PASS
102.850000	**150**	**42**	**Vert**	**43.29**	**40.50**	**2.79**	**FAIL**
106.375000	150	61	Vert	35.07	40.50	-5.43	PASS
116.950000	248	274	Horz	31.66	40.50	-8.84	PASS
165.125000	**150**	**114**	**Horz**	**37.72**	**40.50**	**-2.78**	**PASS**
188.625000	150	85	Horz	30.17	40.50	-10.33	PASS
192.150000	150	95	Horz	35.33	40.50	-5.17	PASS

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
199.200000	**150**	**276**	**Horz**	**52.08**	**40.50**	**11.58**	**FAIL**
205.075000	150	75	Horz	30.25	40.50	-10.25	PASS
212.125000	150	181	Horz	33.41	40.50	-7.09	PASS
219.175000	150	56	Horz	34.67	40.50	-5.83	PASS
225.050000	150	181	Horz	30.94	40.50	-9.56	PASS
248.550000	150	153	Horz	37.99	46.00	-8.01	PASS
299.075000	**150**	**181**	**Horz**	**43.20**	**46.00**	**-2.80**	**PASS**
327.275000	150	153	Horz	37.53	46.00	-8.47	PASS
375.450000	150	361	Vert	36.77	46.00	-9.23	PASS
382.500000	150	181	Horz	36.24	46.00	-9.76	PASS
396.600000	248	160	Horz	36.36	46.00	-9.64	PASS
403.650000	248	236	Horz	36.51	46.00	-9.49	PASS
408.350000	150	238	Horz	39.12	46.00	-6.88	PASS
456.525000	150	71	Vert	38.06	46.00	-7.94	PASS
495.300000	150	65	Horz	36.72	46.00	-9.28	PASS
541.250000	152	107	Horz	36.03	46.00	-9.97	PASS
591.250000	**152**	**205**	**Horz**	**44.22**	**46.00**	**-1.78**	**PASS**
595.000000	152	205	Horz	37.28	46.00	-8.72	PASS
787.500000	152	196	Horz	40.70	46.00	-5.30	PASS
817.500000	252	1	Horz	39.46	46.00	-6.54	PASS
848.750000	252	361	Vert	37.90	46.00	-8.10	PASS
865.000000	252	1	Horz	36.05	46.00	-9.95	PASS
886.250000	152	161	Vert	39.03	46.00	-6.97	PASS
892.500000	152	161	Vert	37.28	46.00	-8.72	PASS
917.500000	152	331	Vert	37.64	46.00	-8.36	PASS

9.2.4 Graphique de 1000MHz à 1500MHz



9.2.5 Graphique de 1500MHz à 2000MHz

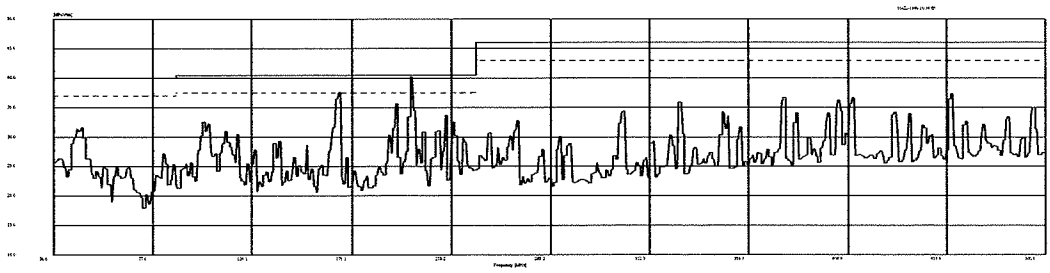


9.2.6 Données

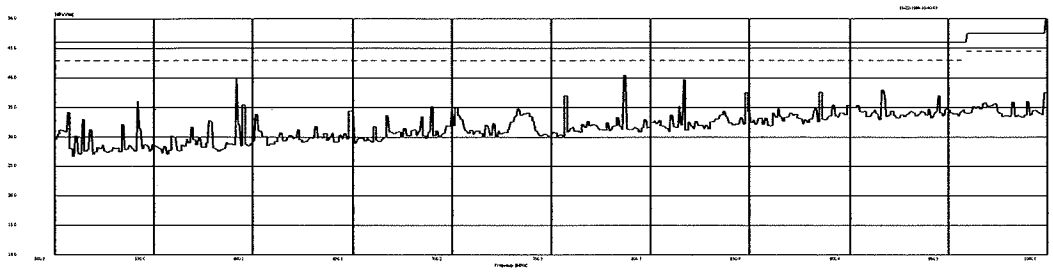
Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
1131.250000	150	9	Horz	46.36	54.00	-7.64	PASS
1178.750000	150	206	Vert	48.22	54.00	-5.78	PASS
1396.250000	150	180	Vert	46.37	54.00	-7.63	PASS
1597.500000	152	38	Vert	45.38	54.00	-8.62	PASS
1706.250000	152	16	Vert	46.64	54.00	-7.36	PASS
1713.750000	152	16	Vert	45.51	54.00	-8.49	PASS

9.3 Câble SUMITOMO

9.3.1 Graphique de 30MHz à 500MHz



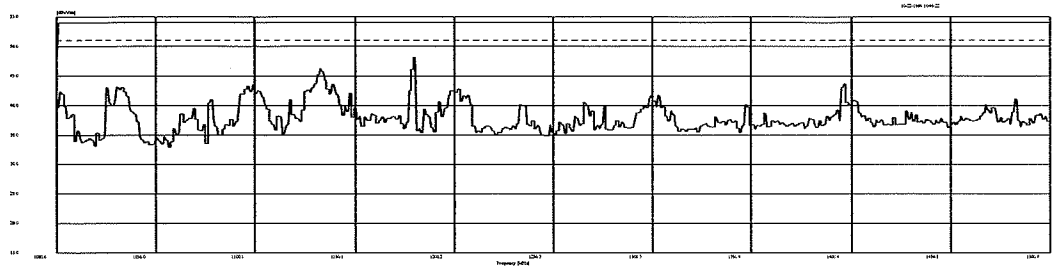
9.3.2 Graphique de 500MHz à 1000MHz



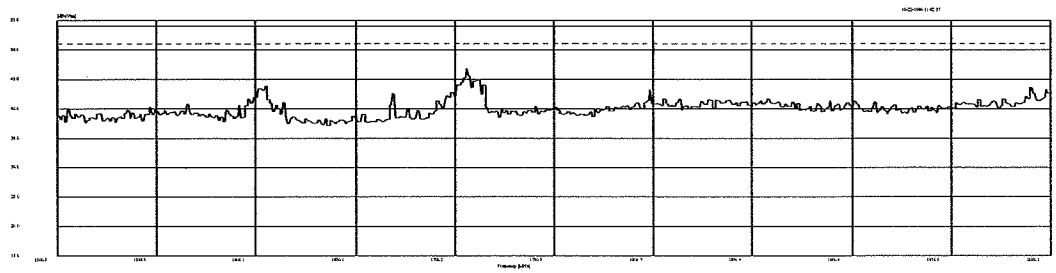
9.3.3 Données

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
42.925000	150	307	Vert	31.66	40.00	-8.34	PASS
100.500000	150	37	Vert	32.55	40.50	-7.95	PASS
111.075000	248	108	Horz	31.01	40.50	-9.49	PASS
116.950000	150	361	Vert	30.36	40.50	-10.14	PASS
165.125000	**248**	**93**	**Horz**	**37.62**	**40.50**	**-2.88**	**PASS**
188.625000	150	272	Horz	30.33	40.50	-10.17	PASS
192.150000	150	254	Horz	35.74	40.50	-4.76	PASS
199.200000	**150**	**254**	**Horz**	**40.27**	**40.50**	**-0.23**	**PASS**
205.075000	150	167	Horz	30.95	40.50	-9.55	PASS
215.650000	150	82	Horz	33.68	40.50	-6.82	PASS
376.625000	150	344	Vert	36.62	46.00	-9.38	PASS
402.475000	150	75	Vert	36.32	46.00	-9.68	PASS
409.525000	150	269	Vert	36.55	46.00	-9.45	PASS
456.525000	150	56	Vert	37.43	46.00	-8.57	PASS
541.250000	152	107	Horz	36.08	46.00	-9.92	PASS
591.250000	152	170	Horz	39.91	46.00	-6.09	PASS
757.500000	152	152	Horz	36.89	46.00	-9.11	PASS
787.500000	152	1	Horz	40.08	46.00	-5.92	PASS
817.500000	152	1	Horz	39.77	46.00	-6.23	PASS
848.750000	252	361	Vert	37.50	46.00	-8.50	PASS
886.250000	252	192	Vert	37.58	46.00	-8.42	PASS
917.500000	152	336	Vert	37.97	46.00	-8.03	PASS
946.250000	152	327	Vert	37.02	46.00	-8.98	PASS

9.3.4 Graphique de 1000MHz à 1500MHz



9.3.5 Graphique de 1500MHz à 2000MHz



9.3.6 Données

Frequency (MHz)	Hgt (cm)	Angle (deg)	Pol	Peak (dBuV/m)	Peak Lmt (dBuV/m)	DelLim-Pk (dB)	Status
1132.500000	150	16	Horz	46.26	54.00	-7.74	PASS
1180.000000	150	202	Vert	48.11	54.00	-5.89	PASS
1706.250000	152	345	Vert	46.89	54.00	-7.11	PASS

~~13.~~10. Recommandations

Pour la suite des essais, se référer au projet 0895_01_02.

EXHIBIT E

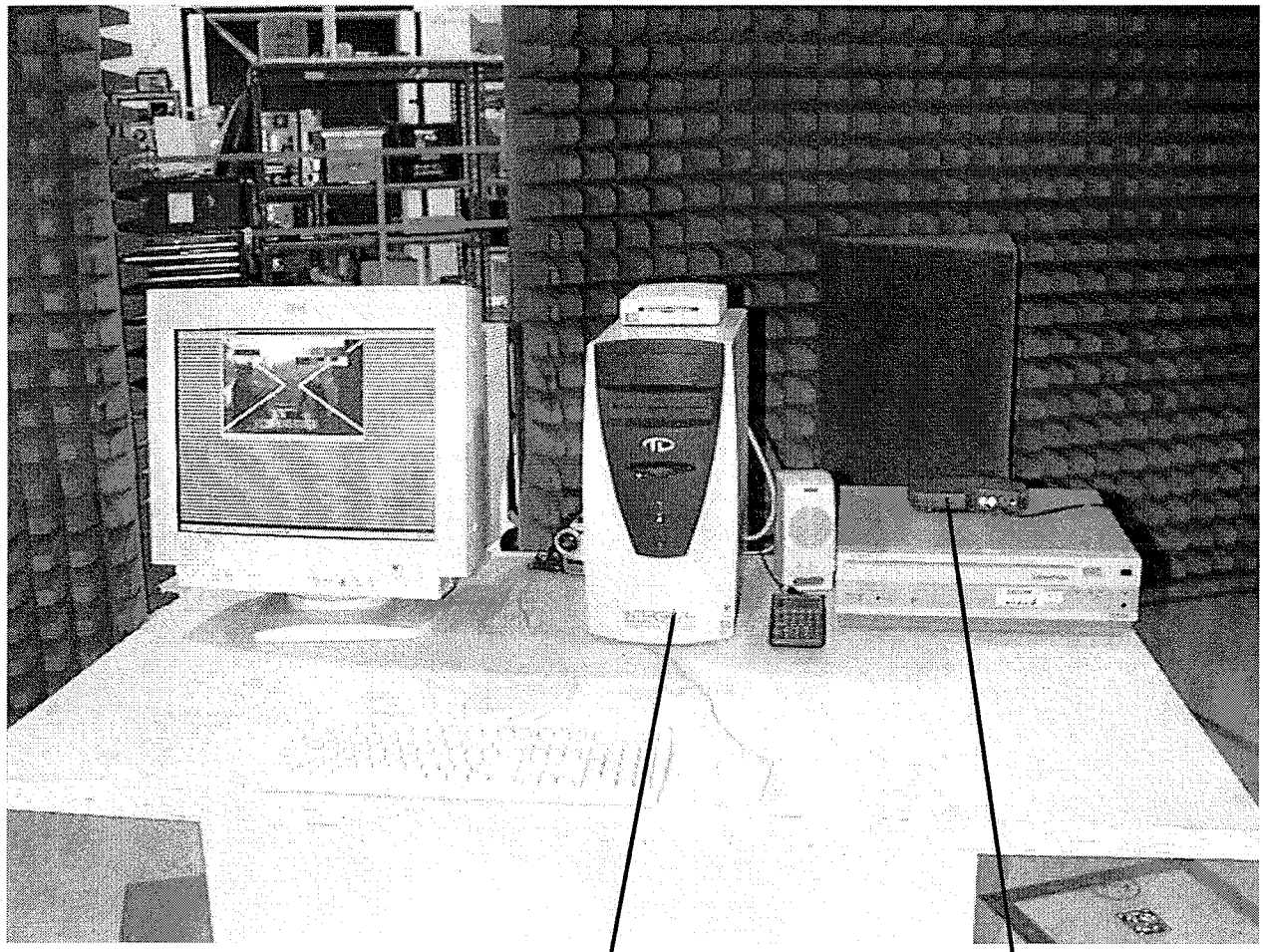


Figure 5.3 Front radiated picture at 3m

Breakout Box

Computer including the two printed circuit boards provided with the RT2000 product